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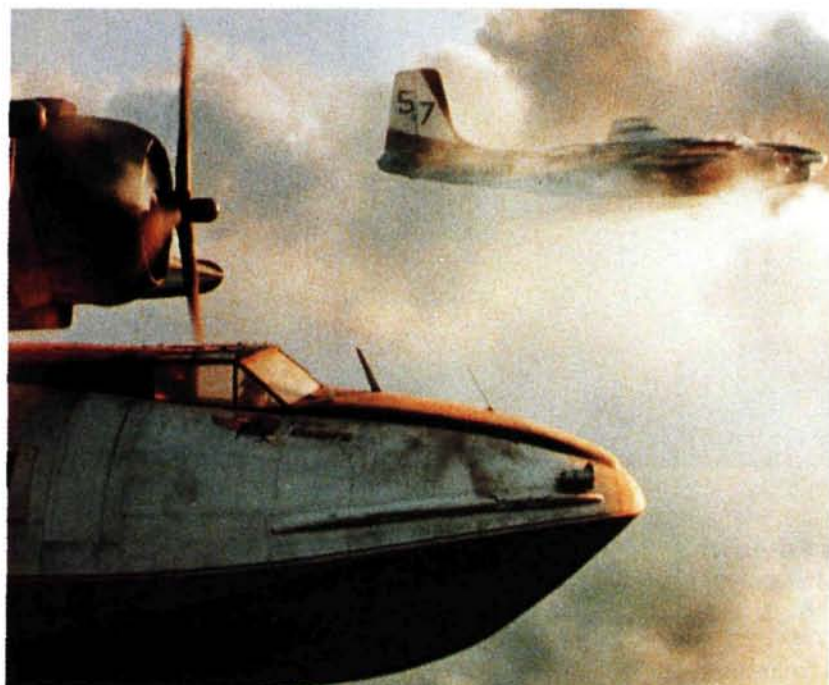
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ON THE COVER: One of the Douglas B-26 Invaders built by Custom R/C Aircraft for the movie "Always" flies through a forest fire created in a warehouse by the special-effects group ILM. Large-scale Invaders and Catalinas were constructed and flown to ensure the realism required in this Spielberg production. (Photos by George Miller.) Inset: Built from a Sig kit, the Smith Miniplane is the handiwork of Rick Dodge, who chose to make it unique with a tiger-stripe paint scheme. Rick's effort is typical of readers' contributions to our "Pilot Projects" section. See more on page 16.

EDITORIAL

by RICH URAVITCH



IT'S SHOW TIME!!

A NEW FLYING SEASON is about to begin! How do I know? I just attended the WRAM show in New York, and next week I'll be in Pomona, CA, for the RCHTA show. These two are the first of many events I'll attend this year, along with several contests, e.g., Top Gun and the Tournament of Champions.

Because these events take place across the country, I get a chance to talk with you folks one-on-one—a part of this job I really enjoy. I use each year's round of shows, contests and fun flies to find out what other modelers are doing, what they're interested in and what they'd like to see. It helps me plan what you'll eventually see on these pages.

The WRAM show was really helpful; in spite of bad weather, R/Cers turned out in droves to see what's happening in the world that occupies so much of our leisure time. Many stopped by the Air Age booth during the three days to share their thoughts. As a result, I have some great ideas to bring to you in *MAN*, including slick, new designs like a twin .25-powered P-61 Black Widow. (We had two prototypes on display, and did they ever get attention!) Also coming up are electric conversions of some currently available glow-powered kits and lots more Tech Tips and How-Tos. You offered all these ideas, and that makes my job easier and more enjoyable!

Attend as many of these shows as you can. Manufacturers and suppliers are always willing to spend time discussing their products. Our product is *Model Airplane News*, and if I'm at an event, stop by and say "hello." I'll always talk...and listen!

MODEL AIRPLANE NEWS

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LOUIS V. DeFRANCESCO, JR.

Publisher
DR. LOUIS V. DeFRANCESCO

Associate Publisher
YVONNE M. MICIK

Editor-in-Chief
RICH URAVITCH

Associate Editor
CHRIS CHIANELLI

Copy Director
LYNNE SEWELL

Copy Editors
KATHERINE TOLLIVER
LI AGEN
BRENDA CASEY

Art Director
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AIRWAVES

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T.O.C. HOPEFUL

I'd like to congratulate you on your fine magazine; it's informative and humorous. I haven't subscribed yet, but I still get one to read and enjoy every month. The reason? When you're 13 and you don't have a job, money doesn't come easy; for that matter, even when you have a job, it still doesn't flow in without hard work!

I've been flying R/C for about a year, and I just bought an EZ Supra Star 25 pattern ship. I know it sounds like a big jump, especially because I never owned a power R/C before. I've flown it successfully once, and its O.S. 32 FSR puts out plenty of horses. I was thinking about entering in the competition at the Las Vegas R/C Fly-In. Do they have 25-size pattern competition for minors? First I have to sharpen my skills.

JOHN SMITH

I couldn't agree with you more! Money sure doesn't flow in without hard work, but that's probably what makes us appreciate what we have that much more. I suggest you continue to practice, practice, practice with your new mini pattern ship. When you feel comfortable with it and can make it do exactly what you want it to do every time, you should probably step up to one of the more contemporary pattern ships, if competition is your goal. If by the Las Vegas Fly-In you mean the Tournament of Champions, that competition is by invitation and includes 10 U.S. fliers among the total field of 20. All of them have been consistent winners in pattern competition at the Masters level. Be prepared to spend a lot of time practicing and developing the discipline and skills required to compete at that level. It can be done, though: last year's 2nd-place winner, Chip Hyde, was only three years older than you! Many of us feel that, if he

sticks with it, he'll be the next winner. Start by flying in some of your local contests.

RAU

FLOATER FROM DOWN UNDER

I'm considering flying off water with a Powerhouse Old-Timer. I was taught to fly R/C with this plane, but after 303 flights, it was hit by a pattern ship that sheared off a third of its port wing; it didn't fly too well after that!

I'm rebuilding it and have included an extra u/c (landing gear) mount below the wing's trailing edge for the aft float-attachment point. The land u/c and float assembly will be interchangeable, and power will come from an Enya 53 4-stroke.

I came back to the hobby after about 35 years because I felt an outside interest would do me good after I retired. What a change since then! Radio was just coming in when I left the hobby; what's available now is a dream! I've only been back for 2 1/2 years, so I'm still basically a rookie.

I was very pleased that I could buy your October edition of MAN at my local newsagent. How can I obtain copies of the September '88 and October '89 "float specials"? The only other plane I've seen with floats was a Cavalier, and it did extremely well; however, its owner left our club, and I'm virtually starting from scratch. I intend to build my own floats, as no commercially built ones are available here.

There's such a lot of talk about floats "floating" around that it's difficult to know where to start. I'm sure MAN will solve my problems. Congratulations on such a good and informative magazine; I only wish the organization down here was large enough to support something similar. Any help will be much appreciated!

TOM BROOKS

Werribee, Victoria, Australia

(Continued on page 10)

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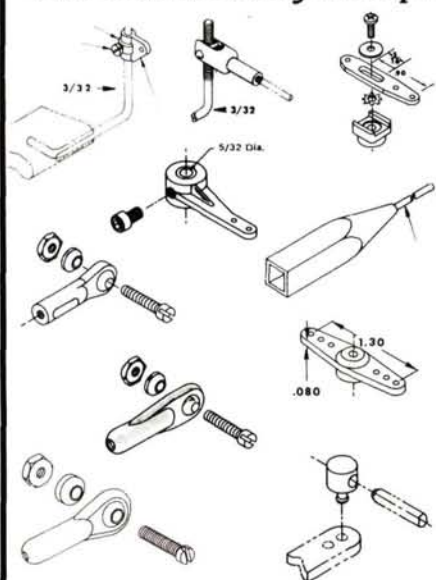
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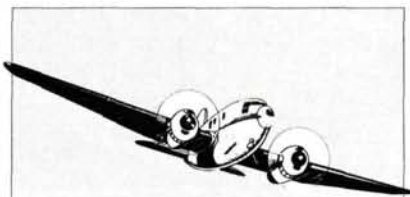
(Continued from page 8)

G'day Tom! Nice to hear that you've re-entered the hobby, and I hope the "dream" quickly becomes a reality. You're right, a lot has changed, and floatplane operation is right in there with some of the more exciting changes. There's probably nothing more graceful than an Old Timer flying off water.

The back issues you've requested are available for \$3.50 each, plus postage, and they contain a lot of helpful (we hope!) information.

Thanks for the nice words about MAN; we all appreciate them and are looking forward to receiving some photos of your models. Maybe we can include them in our "Pilot Projects" section!

RAU



STEALTHY COMMANDO

Hello out there! I'm looking for John T. Murphy of somewhere in New Hampshire. John, I'm interested in reviewing your construction project, but you neglected to include your address in your letter. Please contact me for further information.

RAU

CROSS-OVER CANDIDATE?

I'm really into R/C cars, but recently I've been looking into electric ARF airplanes, so I can take my car's electronics and put them in the plane.

I want something aerobatic that looks good, and the Kyosho Flash sounds pretty good. What's your opinion on the Flash? Which electric ARF would you suggest?

Your magazine is excellent; keep

it up! Thanks again!

PAUL T. PSZYBYLSKI

Brookfield, WI

Paul, I think you'll find a whole new added dimension of R/C in airplanes over that available in cars. As a matter of fact, many of our sister magazine's (R/C Car Action) readers have taken the path you're considering, and they now read both magazines. With the tremendous growth electric flight is experiencing, it's only natural to take advantage of some of the car-developed technology. First thing (you probably already know this): do not transfer your "car's electronics" directly into your airplane!! They operate on a "surface-only" frequency, are illegal for airplane use, and could create a potentially dangerous situation. We reviewed the Kyosho Flash last year and found it to be a well-thought-out, fine-performing model. Keep in mind, though, that it isn't a trainer; you should have some flying experience before trying an aerobatic-type model. Good luck!

RAU

CRO-MAGNON JET CONTROL-LINER?

A few weeks ago, my father told me about model airplanes he had when he was little (back in the Stone Age). He used to fly prop-driven control-line models, but he had some friends who flew jet-driven ones that had speeds greater than 200mph. These jets ran off a powerplant that was called a Dynajet. The Dynajet had few, or no, moving parts. The reason that it isn't used today is probably because the plane sometimes caught on fire. Do you have any info on this?

MATT McKEE

Anchorage, AK

Boy, Matt, you sure know how to

We welcome your comments and suggestions. Letters should be addressed to "Airwaves," **Model Airplane News**, 251 Danbury Road, Wilton, CT 06897. Letters may be edited for clarity and brevity. We regret that owing to the tremendous numbers of letters we receive, we cannot respond to every one.

hurt a guy! I used to fly control-line back in the '60s, but you probably don't remember things like hippies, Elvis, psychedelic colors, the Rolling Stones and "love-ins." Ask your dad; I bet he can fill you in! The Dynajet and its clones (now there's a word that wasn't even around back in the Stone Age!) were considered pulse jets; their only moving part was a pulsating reed valve, through which the fuel was introduced to the combustion chamber. Ignition was initiated by a spark coil and sustained by combustion. You're right; the planes did sometimes catch fire because of fuel puddling, but more important, they were very noisy, and had no effective means of varying the power setting. Fire-and-brimstone qualities aside, they were pretty inefficient. They produced less than 5 pounds of thrust and required great care when installed in enclosed, scale-type fuselages because of the heat they generated. Most "old-time" modelers (over 40) have seen one. Doylejet (P.O. Box 60311, Houston, TX 77205) has a variety of jet-propulsion systems, and they might be able to help you further.

RAU



FANJETS

In the December '89 issue of *Model Airplane News*, you printed an article on the British International Ducted Fan Fly. Included in the articles were pictures of two Grumman F9F-2 Panther

Jets, which the caption identified as belonging to Peter Nye.

I've long been interested in building a model of this plane, having had a very close association with it during the Korean conflict with Carrier Air Group 19 flying from the USS Oriskany. I read a similar article in another magazine, which included pictures of the same planes. The article in that publication identified the company producing the plane as Fanjets, 39-40, Portsmouth Road, Artington, Guildford, Surrey, U.K.

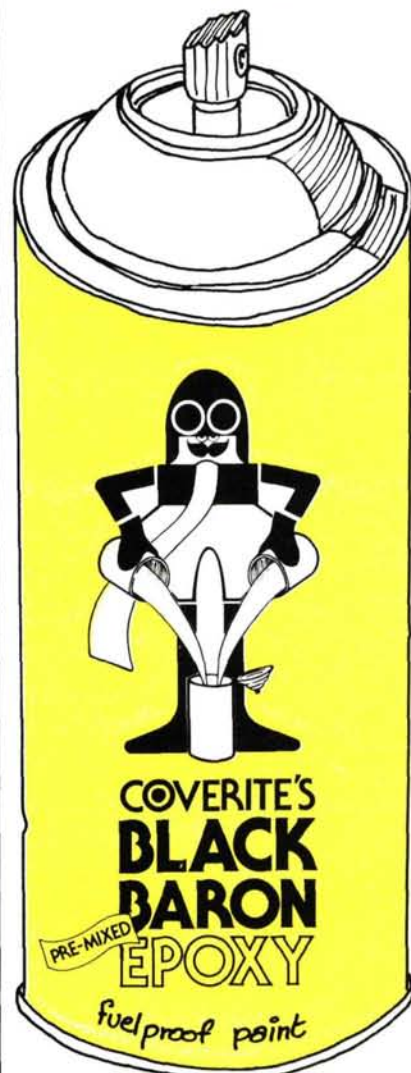
I wrote to the company at that address to request additional information, but I haven't received a reply. Do you know if the company and address I used was correct, or where I can obtain additional information on this particular model? Do you know if Peter Nye is involved with this company or any other organization that produces this plane?

I'd appreciate any information you could provide that would enable me to contact those involved with this particular model.

MARVIN C. WADE
Columbus, OH

Marvin, that was the address given to me by Peter when I attended the British Fan Fly. The only thing missing is the postal code (GV3 1LN) which shouldn't have prevented him from receiving your letter. At any rate, I suggest you try again, as the model will certainly rekindle some old memories for you. In the interim, you might try contacting Jet Hangar Hobbies (12130G Carson Street, Hawaiian Gardens, CA 90716). They have a Cougar and were showing (a long time ago) a Panther. Perhaps they have the material you need. Let us know how you make out.

RAU



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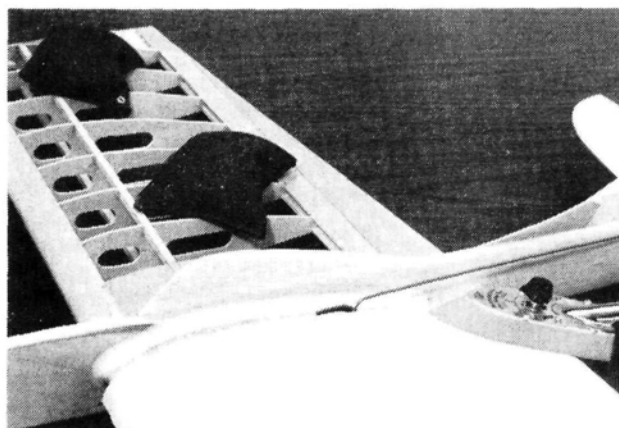
MODEL AIRPLANES

by JOE WAGNER

Beanbags and peanuts for R/C models

R/C AIRPLANES suffer just about as much damage during transportation as they do from flying. In the trunk of a car or the back of a station wagon, models can vibrate and shift; they rub against one another and anything else in their vicinity, and this produces abrasions, dents, punctures and broken parts—or what might prove to be even worse: warped and misaligned flying surfaces.

These troubles can be easily and inexpensively avoided. All you need is a box of gallon-size self-locking plastic freezer bags and



Weight-Mates firmly hold down one wing panel, so covering the other panel single-handed is easy.

a supply of packaging plastic "peanuts." Stuff the bags as tightly or as loosely with the "peanuts" as required, and pack them between, around, and underneath your airplanes whenever you load your vehicle with R/C models. These custom-made "beanbags" will work as well to protect your aircraft as they do to protect shipments of cam-

eras and electronic instruments.

Another "beanbag" that comes in handy for modeling is the denim Weight-Mate made by Bell Rock Industries*. Sold in packages of five, the cleverly-designed Weight-Mate is a 4x6-inch double-stitched bag of heavy-duty denim. Weight-Mates are supplied empty, to be filled by the user. I like no. 9 lead birdshot; it costs about 60 cents a pound from reloading suppliers and usually comes in 25-pound canvas sacks. Since each Weight-Mate can hold 5 pounds of no. 9 shot, one "reloader's sack" will fill all five of the bags in one package of Weight-Mates. For most modeling purposes, about 4 pounds of shot per Weight-Mate is better than five, because limper beanbags conform more readily to the contours of whatever they're placed around.

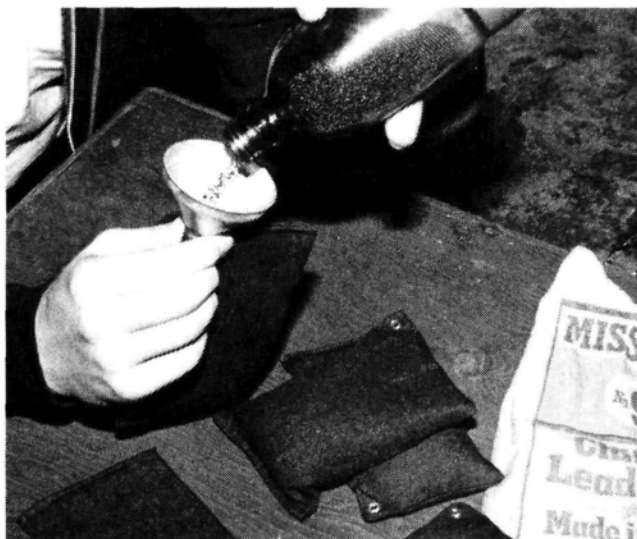
Weight-Mates have a va-

riety of applications. These heavy little bags can be used as clamps to hold one model component firmly in place on another while you glue them. They're also good for holding down one wing panel so it won't shift while you're covering the other; and a Weight-Mate placed on a fuselage top just in front of the fin provides a powerful steadying effect while you tighten engine bolts or adjust a throttle linkage.

Each Weight-Mate comes with a metal eyelet that's crimped into one corner for attaching a cord. This feature allows a pair to be tied together with a length of heavy twine—useful as airplane hold-downs at the flying field. (For this purpose, it's probably best to pack the Weight-Mates to their full 5-pound capacity.)

Filling the Weight-Mates is easy: a 1/2-inch unstitched part of the seam at the corner opposite the eyelet provides access for a small funnel. I don't recommend that you pour shot directly from the canvas sack into a Weight-Mate because the heavy sack is far from easy to control. Instead, I use a small plastic pop bottle as an intermediate shot container.

With the funnel, I first half-fill the bottle with shot poured from the sack. After that, I transfer the funnel to a Weight-Mate and fill the



It's easy to load Weight-Mates with birdshot; just use a small funnel and a plastic pop bottle for a shot container.



A party-packed car trunk: stuffing another dozen or more "beanbags" around and over everything ensures a damage-free trip to the flying field.

denim bag from the pop-bottle supply. I weigh each bag occasionally to ensure uniformity (though there's no real need for this). Finally, I seal the corner gap of each Weight-Mate with thick CA.

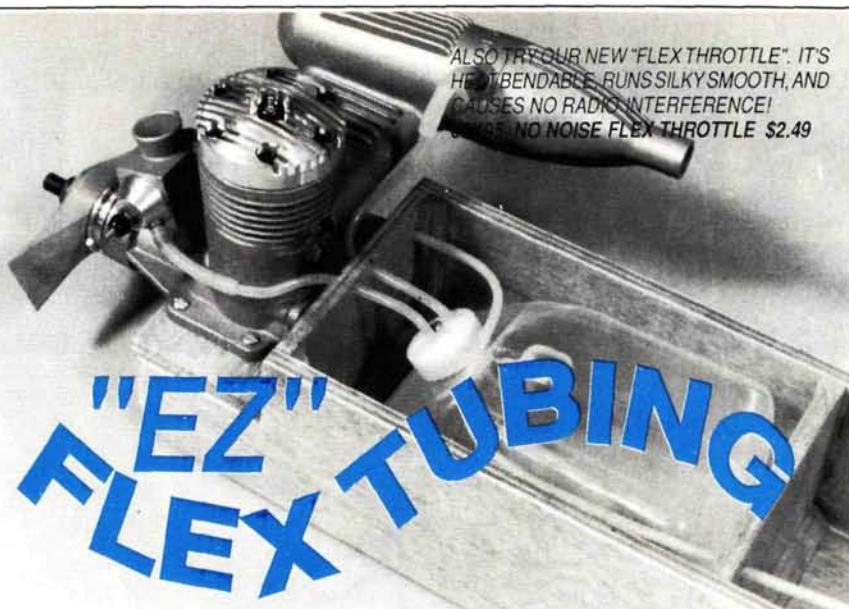
I'm now fully equipped with plenty of light and heavy beanbags. Neither batch took long to



The ingredients for protective beanbags: at last, there's a use for all those foam and plastic peanuts that come in our mail-order packages!

make, and they'll come in handy during the coming flying seasons. I'm sure it would be well worth an hour or so of your time to make some for yourself.

**Here's the address of the manufacturer featured in this article:
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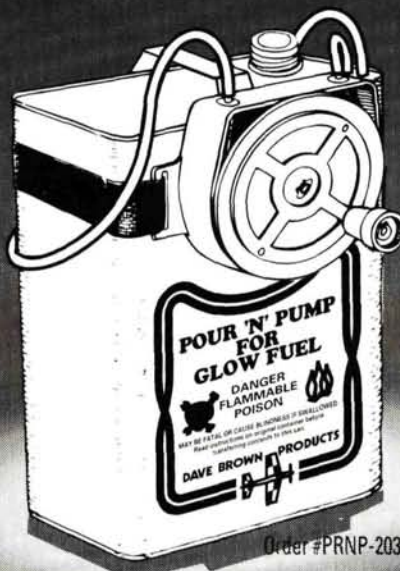
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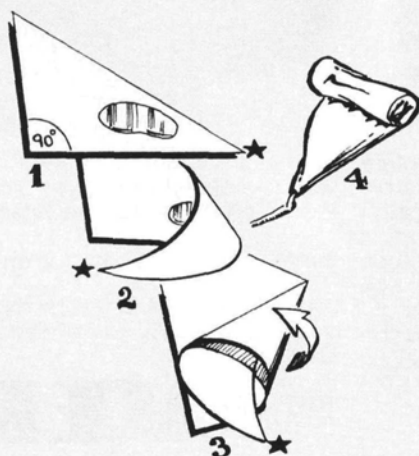
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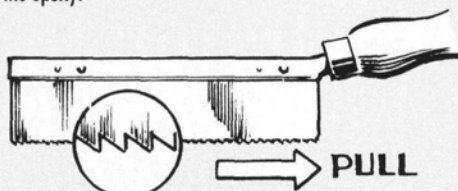
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by JIM NEWMAN



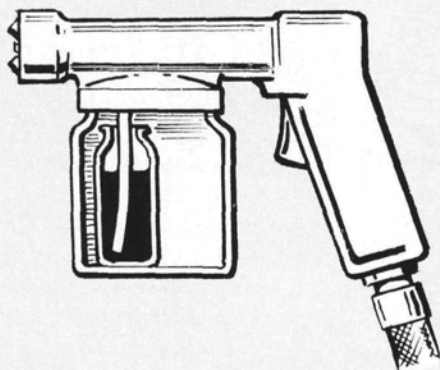
EPOXY TUBE

If you need to dispense a large quantity of epoxy neatly, this idea—borrowed from bakers—will do it. Cut a paper triangle, place epoxy where shown, then roll the triangle to make a cone. Snip off the tip of the cone, then roll like a toothpaste tube to squeeze out the epoxy.



MODIFIED SAW

For better control of your hobby saw, modify it to cut on the pull stroke. Pry open the backing strip, turn the blade around, then punch the backing in two new locations.



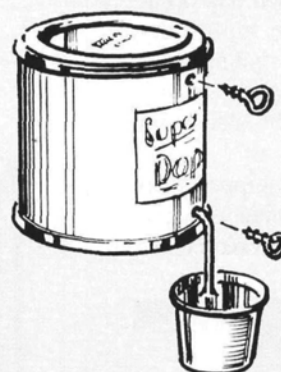
SPRAY GUN SOLUTION

If only a very small quantity of paint is required, the spray gun's dip tube often won't pick it up. Put the paint in a small bottle, which, in turn, is placed in the gun's paint container. The dip tube will keep it in place.



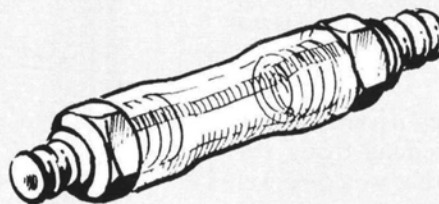
MINIATURE BOOKS

Miniature books and maps, cut from magazine ads (e.g., the Book-of-the-Month Club), can be glued to balsa blocks or to a bound scratch pad and trimmed as shown. Place a couple on the parcel shelf or instrument coaming of your scale model.



DOPE DISPENSER

It's more economical to buy dope in larger cans, but it's messy to pour. Drill two holes in the can and insert screws as plugs. To dispense dope, remove the lower screw; to control flow, loosen the top one as desired.



PLUG PROTECTION

To protect their threads and elements, spare glow plugs can be inserted into the ends of plastic or rubber fuel lines. Several lengths can be fastened to a strip of wood in the flight box.

(Continued on page 18)

PILOT PROJECTS

A LOOK AT WHAT OUR READERS ARE DOING!

SEND IN YOUR SNAPSHOT\$!

MAN is your magazine and, as always, we encourage reader participation. In "Pilot Projects," we'll feature pictures from you—our readers. Both color slides and color prints are acceptable.

All photos used in this section will be eligible for a grand prize of \$500, to be awarded at the end of 1990. The winner will be chosen from all entries published, so get a photo or two together plus a brief description and send it in!

Send those pictures to: Pilot Projects, Model Airplane News, 251 Danbury Rd., Wilton, CT 06897.



WHISTLING DEATH FROM BROOKLYN

One of the prettiest Corsairs to "patrol" the East Coast is this one, which was built by Ralph Costagliola of Brooklyn, NY. The starting point was a Byron Originals kit, to which Ralph added a Q-50, Robart retracts and lots of TLC. For accuracy, he duplicated the markings of Marine Fighter Squadron (VMF) 17 from 1943. At the time Ralph sent the photos, the F4U-1 had

logged six flights from its home base of Floyd Bennett Naval Air Station—naturally! Ralph asks us to "keep up the good work." You too, Ralph!

IMPULSIVE MODIFICATIONS

Take an Air Flair Impulse Plus kit, add some cosmetics (e.g., re-shaped wing and stab tips, plus a canopy and wheel pants), some power provided by a Q-40, cover it all with an attractive MonoKote scheme, and you'll probably end up with a big bird as pretty as Sal Barbagallo's. He's from Oakland, NJ, and he tells us his 17½-pounder was a great kit. It's very fast, excels in the vertical, and it was the topic of an entire presentation at his club's last meeting. What more can we say?



LET'S BE PERFECTLY CLEAR...

A frozen Nixon Lake provides the background for this Norduyn Norseman that Ron Andrews of Vermilion Bay, Ontario, built from a Unionville Hobbies kit. It's powered by an O.S. 48 Surpass 4-stroker, and depending on the time of year, Ron fits it with skis, wheels, or floats! As owner of the Nixon Lake Resort, Ron hosts an annual R/C float fly on the third weekend in June. This is really having your own private flying field! By the way, Ron, is Nixon Lake near Reagan River or Bush Brook??



SMITH MINI-TIGER?

The Rhode Island Aeromodelers have awarded Rick Dodge back-to-back "Most Unique" trophies; a look at the photo should give you a hint why! Rick started with a stock Sig Miniplane, covered it with Super Coverite and painted it with Black Baron epoxy. The tiger stripes were added with an airbrush, and a Super Tigre S-45 was chosen for power. Rick reports that it's a "super snap-roller." It must have whet his appetite for aerobatics, because he's now practicing the Sportsman pattern with a similarly "tigerized" Utter Kaos.



JUNGMEISTER JUNGSTER

Dennis Tabler (Knoxville, TN) tells us that he has been modeling for 46 years and that his 1/4-scale Buecker Jungmeister is one of his latest projects. Scratch-built from Dave Platt drawings, the Jungmeister weighs 14 pounds and is covered with doped Sig Coverall. Power comes from a Zenoah G-23, and Dennis says it flies as if it's on rails! Engine vibration caused some problems, so he decided to try the "soft-mount" system to dampen the shakes. Now we know where the expression "bipes are beautiful" came from!



DC-3s—BIG AND FOREVER!!

No one will ever accuse Burl McCann from Clarkston, WA, of not being into giant scale! He built his rendition of an 1/8-scale DC-3 from Nick Zirol plans and powered it with a pair of ST 3000s. Weight?—a petite 48 pounds! Burl ignored the wide range of military schemes for his Dakota/Gooney Bird/Roger Four Door (equipped with Robart retracts); instead, he finished it in the more "civil" livery of an erstwhile hauler for Western Airlines. Burl concluded his note by saying, "I hope it will make it into MAN; if not, oh well." Get a grip, Burl: nonchalance is *not* becoming! Send us photos of some other spectacular projects!



CLASSIC BEAUTY

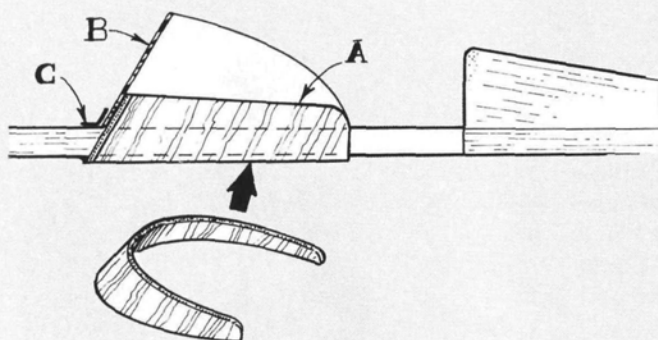
From way down South in Roswell, GA, comes Earl Brightbill's 1/4-scale electric Monoprep, shown here with his pretty 8-year-old daughter, Suzanne. The Monoprep was scaled up from MAN plan no. 6811 and uses lengthened Kadet Senior wing panels. Propulsion is provided by an Astro 60, which uses 28 to 35 SR 1250 Magnum cells. Earl's statement that "it's not underpowered" seems to indicate that its weight (11 pounds, 2 ounces) presents no problem. Beautiful effort, Earl!



HIGH-PERFORMANCE WALKER

Just reading the specifications of Kermit Walker's Reed Falcon is enough to get the aerobic blood pumping! Imagine: it weighs 11 1/4 pounds with a 54-inch span, and a ST 3000 is "nestled" in a space previously allotted for a .90! Kermit built the airplane with the express purpose of flying in the IMAC Unlimited category where vertical maneuvers requiring gobs of power abound. Did he meet the objective? Sounds as if he did: out-of-sight vertical rolls from a 100-foot takeoff roll, consecutive knife-edge loops and climbing, vertical snap rolls! Kermit, whos hails from Lodi, CA, says his piloting skills need to catch up with the Falcon's performance potential...and I *still* have problems with inverted flight?!

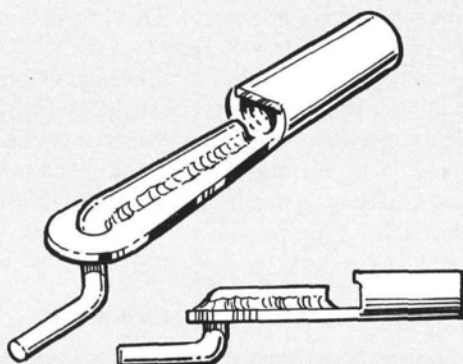




WINDSHIELD MOUNTING

Cut a narrow flange from thin plywood (A), glue it around the inside edge of the cockpit opening, then glue the canopy or windshield (B) to that. This provides a much larger gluing area, which can then be covered with trim tape for a neat finish.

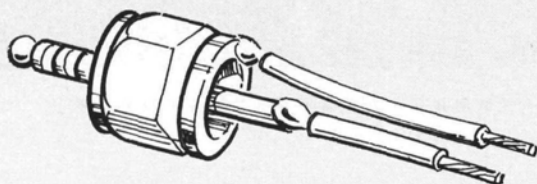
Dale Nicholls, Clayton, Victoria, Australia



ADJUSTABLE Z-BEND

Remove one cheek from a metal clevis, sandpaper it clean, then hard-solder a short, wire Z-bend to it. This assembly is then attached to a regular threaded rod; it's much more useful than the usual non-adjustable Z-bend.

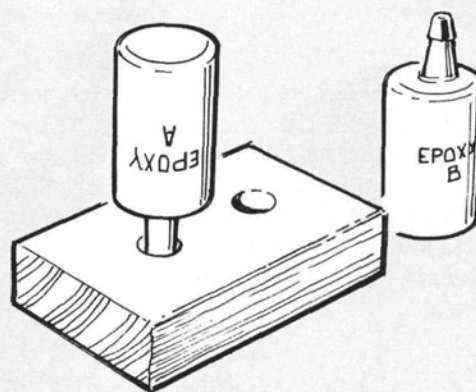
Geir Nicklasson, Oslo, Norway



COX NI-CD ADAPTER

Our contributor avoids buying dry cells for his Cox engines by using a McDaniel (or similar) clip-on Ni-Cd. Chuck the hexagon of a glow plug in the drill, and run it at low speed while applying a hacksaw to remove the threaded part. Solder two wires as shown, support the joints with shrink sleeves or epoxy, then solder the other ends to a Du-Bro Kwik-Klip (no. DU-149).

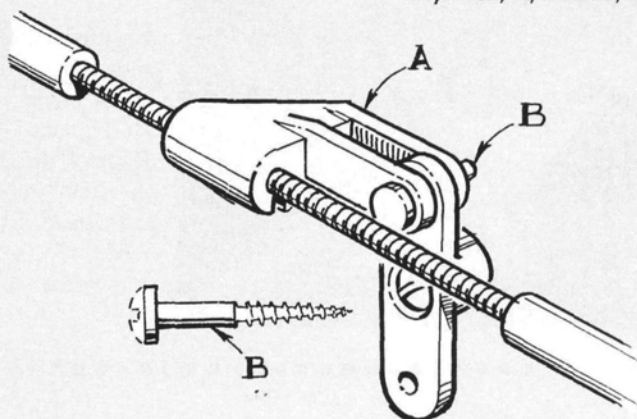
James Gay, Scottsboro, AL



EPOXY BOTTLE STAND

It's time-consuming to wait for the epoxy to drain down before you can use it. Drill a couple of 3/8-inch holes in a piece of 2x4; just before you need the epoxy, invert the bottles in the holes.

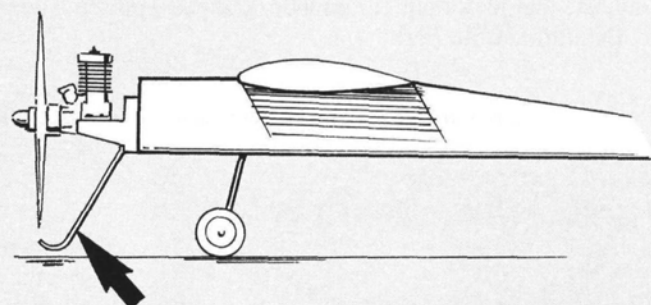
Henry A. Loos, Sr., Waterford, NY



DETACHABLE/ADJUSTABLE AILERON LINK

The deep jaw keeper (A) (try Hobby Lobby's) is attached to the servo arm by a clevis pin (B), which is made from a suitable screw or nail. When the keeper has been snapped over the threaded rod, the pin can't back out. I show Nyrods screwed onto the rod.

F.W. Walker, Shaw, Lancashire, England



PROPELLER PROTECTOR

In the early 1900s, airplanes had a skid under the nose to protect the propeller from coming into contact with the ground. R/C beginners can use the same idea. Use 1/8- to 5/32-inch-diameter music wire to make this skid, which is then bolted to the motor mount. Make it just long enough to allow the model to come up to the horizontal position.

Avi Ben Menahem, Rehovot, Israel

FIFTY YEARS AGO

INNOVATIVE DESIGNERS...AND FREQUENT FLIERS?!

by BRENDA CASEY

MODEL AIRPLANE NEWS



WE TAKE many things for granted, like being able to jet off to the Caribbean or zip from Newark to Boston on the 40-minute Shuttle. Some of us forget there was a time when there were no passenger airplanes; that's as unbelievable as Burd offering Dick Korda's world-record-holding model plane for \$.29 or a super Cyclone engine that cost only \$15!

Perhaps you remember the awe and excitement over the first Boeing 314 Atlantic Clipper. Imagine—now you could contact a travel agent and book

passage around the world by air! Maybe you were one of the lucky 74 passengers to climb the gangplank into the huge, silvery, luxury airliner. You took a seat in the spacious dining/recreation salon on a chair stuffed with "curled Australian horse hair with latex." Maybe you held your breath as the four 14-cylinder Wright GR-2600-A2 engines roared and lifted the 82,500-pound sea giant (with its 152-foot wingspan) up off the water. Enjoy the trip as the Yankee Clipper reaches cruising speed (160mph)—Europe's only 24 hours away!

As large as a five-room bungalow, this aircraft had everything: two full decks; a bridal suite; a spiral staircase leading to the control room, cargo holds and the crew's quarters; call buttons; even a drinking foun-

tain! It was a remarkable feat of engineering, and aspects of its design didn't come easily. The plane needed the power of two locomotives; luckily, the new Wright engines had just been introduced. It needed lateral stability in the water; the solution was hydrostabilizers, or sea-wings, which also provided room to store fuel. A Boeing control stab system was used, and as the engineers fine-tuned the design, the single rudder became a double, then a triple.

LOOKS AREN'T EVERYTHING

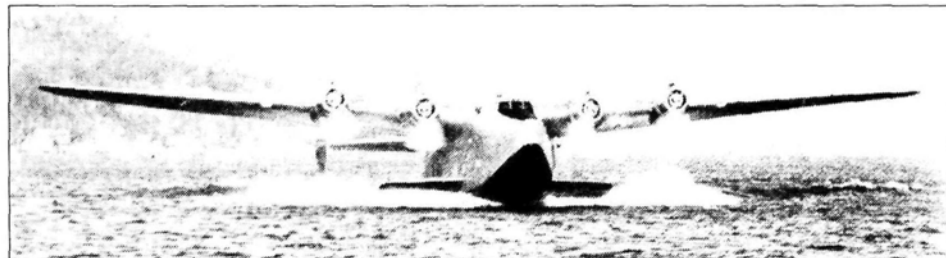
Models builders were just as ingenious, and they agonized as much, it seems, over their smaller-scale crafts. They sought the right propeller, the best aerodynamics and a design (like that of the Doodle Bug) that could consolidate the most power into a smaller frame. Sometimes, they borrowed ideas from full-size planes. Designer/pilot Steve J. Wittman's winning design, a modified version of his own Chief Oshkosh, was scaled-down so MAN readers could build their own. Wittman's Curtiss D-12-powered National Air Race Winner debuted in

1937, and with 400hp it flew as well as those with three times the power! Even more phenomenal speed was achieved by clipping the wings. Though its boxy body, stubby wings and long tail-moment arm looked rather odd, the model was realistic and had a simple, yet strong, fuselage. For its size, it climbed steeply, gave a long, fast, flat glide and a fast landing, as long as you ran its small wheels over a smooth surface; otherwise, it would "trip" over its nose.

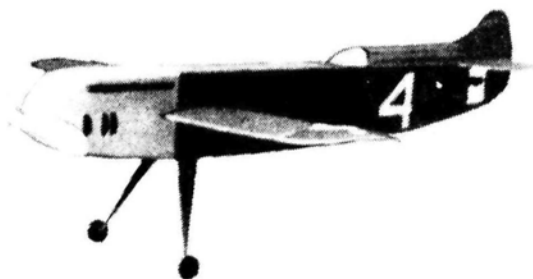
RISKY BUSINESS

Although the aviation industry was booming, and the war in Europe kept up a steady demand, airplane manufacturing was a risky business. (According to "Gas Lines," scale gas models were a great help to research and development, serving as miniature prototypes with which to test new materials, construction and designs.) While a plane might cost \$50,000 in lots of 100 (the price of a pair of Pentagon pliers today!), start-up costs were much higher, and it took time to get a return on your investment. Vultee

(Continued on page 74)

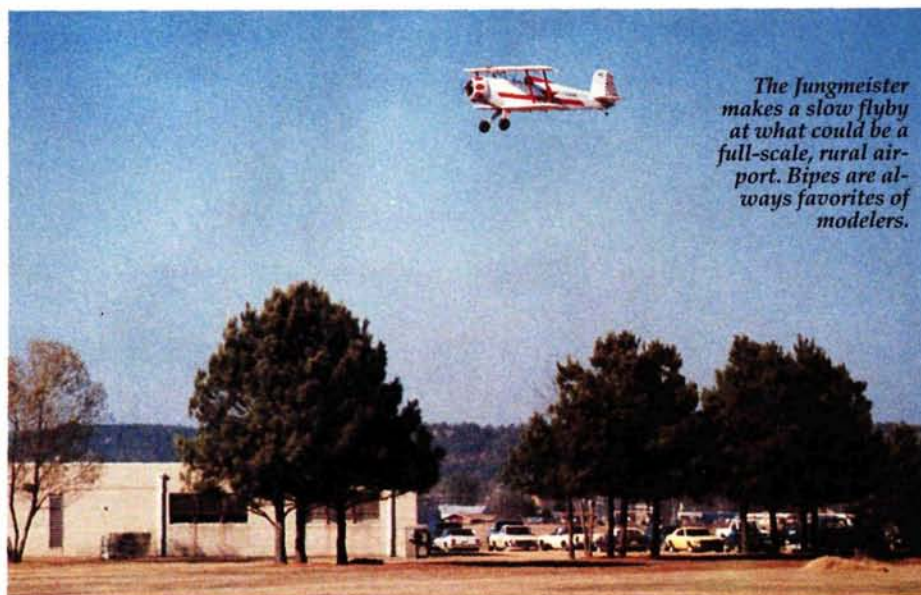


America's new frontier of aviation—Boeing's Atlantic Clipper. This "ship of the sky that sailed the seas" could take you around the world!



Stubby, but speedy! A scale model of S.J. Wittman's winning design.

JUNGMEISTER



The Jungmeister makes a slow flyby at what could be a full-scale, rural airport. Bipes are always favorites of modelers.

Typically Teutonic in tradition;
performance with efficiency

by FLOYD MANLY

"THE GREAT PLANES," one of several books written by noted aviation author James Gilbert, includes photographs and descriptions of 26 vintage aircraft that he considered to be the most interesting of their type. One of these was the 1937 Bucker Jungmeister.

Gilbert describes the



Classic proportions support the belief that "if it looks good, it'll probably fly good."

snap rolls, landing approaches and the "mad, insane maneuvers" that

Rumania's Prince Cantacuzeno performed in his Jungmeister. It was untouchable in international championships and, in later years, only the more powerful, faster Zlin was able to edge out this agile biplane.

Designed by Carl Bucker, the Bu-133 Jungmeister (or Young Master) evolved from the post-WW I trainer, the Jungmann, which was used by the German civil flying organization. They were flown in



Crisp-looking trim scheme enhances the attractive lines of the Bucker. Hard to believe the design is 50 years old!

Switzerland to circumvent the postwar Allied ban on a German military air corps. Of the 600 Jungmeisters produced, about a dozen are still flying today. So responsive were the controls that it has been said this aircraft didn't need to be flown through maneuvers—you just *thought* about them and they happened!

I originally designed this "almost-scale" model of the Bu-133 to fill my requirement for a mildly acrobatic biplane. As it turned out, it was so wild that it wanted to chew off its own tail whenever the sticks were slammed from corner to corner. Gentle stick pressure, however, made the Jungmeister behave well.

I've built six of these planes, and I have another under construction. The one now on the board is a back-up ship, and it's the one you'll see in most of the photos. I need another one in case I do something stupid again—like pulling up-elevator after doing inverted Limbo passes. Each plane was a lot of fun, and I'm a firm believer in sticking with something that works.

There are no special building techniques required, but keep in mind that if the building sequence or material sizes written here vary from the plans, believe the plans. Many builders (including me) never read the instructions unless they have a problem, so the plans *must* be right.

LOWER WING

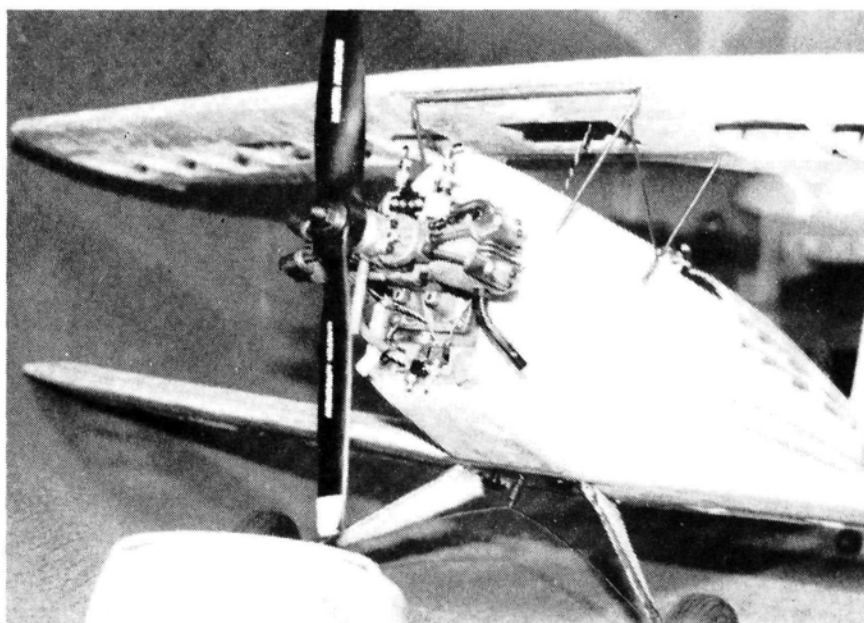
To eliminate the need for pins, lay the plans over an LJ Lind* Model Magnet Building board, and protect them with wax paper.

(Once you've used this board, you'll wonder how you ever did without it!) Build the wing panels simultaneously, because the swept-back panels must be joined before the sheeting can be installed. Position the lower spars over the plan, and lock them into place with the magnets (or pins, if you're still in the dark ages), then add the ribs one at a time and glue with CA. If you check the alignment after

SPECIFICATIONS

Type: Semi-scale biplane
Wingspan: 53.5 inches
Length: 45 inches
Weight: 6.5 pounds
Wing Area: 967.4 square inches
Wing Loading: 15.48 ounces/square foot
Materials Used: Conventional balsa, ply
Construction: Conventional, built-up

Saito opposed-twin 4-stroker was just one of the engines installed in the Jungmeister model. Excellent scale sound and great pulling power in the vertical.



every glue joint, you'll have a true wing.

When all the ribs of the outer panels are in place, shim the TE of each panel so that the center section mates properly. After the center section has been completed and the outer panels have been joined with the proper dihedral, add the sheeting to the top of the wing before turning it over to sheet the bottom. To accommodate the landing-gear blocks and form the servo bay, add the TE strip and *all* the bottom TE sheeting before doing any cutting. The wing-mounting dowel will be added

later. The wing tips should be attached at this time.

Installation of the LG blocks and the ply servo-bay floor provide all the required dihedral bracing. Of course, the center section will be fiberglassed after all the other work has been done. Cut out the ailerons by slicing through the sheeting, top and bottom; then use an X-Acto saw blade to cut through the ribs along the slice line. After you've added the 1/8-inch hard-balsa face pieces, the ailerons should fit back into the wing with no gaps or overhang. To reinforce this area for the wing at-

. . . .
 Welcome
 back to the
 world of
 real
 flying!

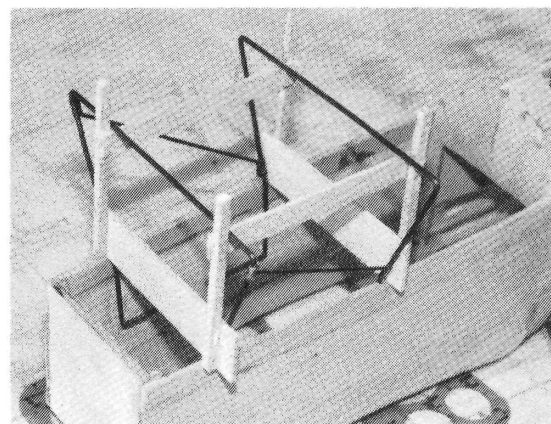
taching dowel, add the center R3 ribs. The fore and aft shear webbing can be glued to the spars now, followed by the capstrips and the center sheeting.

Now is the time to move outdoors or to turn on the exhaust fan, because you're going to raise a little dust while you do some final sanding before covering. Don't rush this task. The two wings must be identical or the aircraft won't behave well. Mounting the hardware for the servo, the Nyrods, the bellcranks, the control horn and the strut plates is straightforward, so I won't go into detail beyond that shown on the plan.

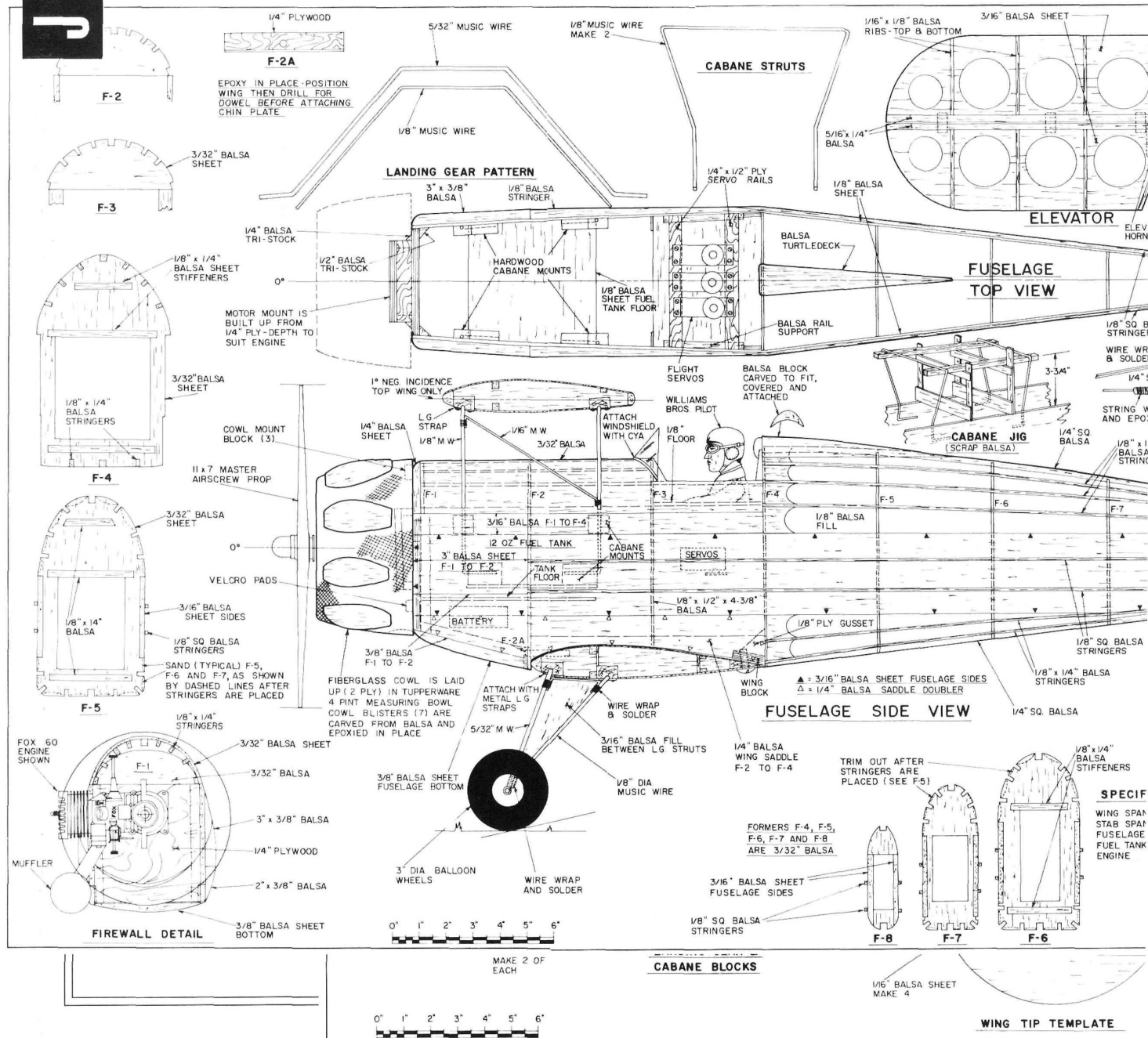
Are you wondering about the wing-bolt holes and the dowel? I'll do these after fitting the wing to the fuselage.

UPPER WING

The top wing is almost identical to the bottom wing, but it has no dihedral, and the servo bay is open on the lower surface. Rather than having one servo in the bottom wing with connecting rods



Cabane strut installation uses temporary balsa jig to both simplify fabrication and ensure the accurate wing alignment that's so important in a biplane.



driving the top wing ailerons, each wing has been designed to have its own servo. There are a number of advantages to this design: the wings are easier to align initially; they're much easier to maintain; and each servo provides a back-up for the other.

I once had an "exciting" time when the bottom servo became disconnected and locked full over. I saved the aircraft by holding full-opposite aileron on the top wing and controlling yaw with the rudder. It wasn't a pretty landing, but the pilot walked away! A simple Y-harness connects the servos electrically without your having to fiddle with mechanical ways of keeping them matched. Note that the orientation of the bellcranks is different for the top and bottom wings.



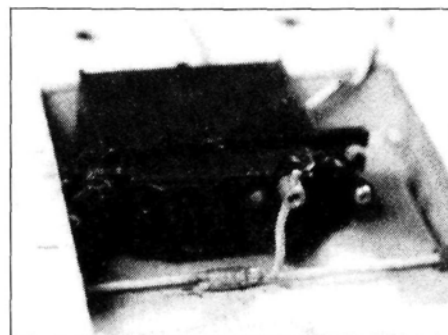
Single-cylinder head of Fox 2-stroke .60 peeks through the cowling just enough to ensure proper cooling.

Construction of the tail feathers should be easy—just follow the plans. The tail-wheel position isn't scale, but was chosen for ease of installation. The cowl was laid up from fiberglass. (I used a plastic measuring bowl as a mold.) The individual cylinder blisters were made by laying glass-cloth over a mold and dribbling on thin CA. Each was trimmed to shape and glued with CA to the cowl.

The plans show provisions for mounting engines of a variety of front-to-back dimensions. By

using the optional fire-wall box, you can fit whatever you have. I've successfully installed a Fox* .61, a Fox

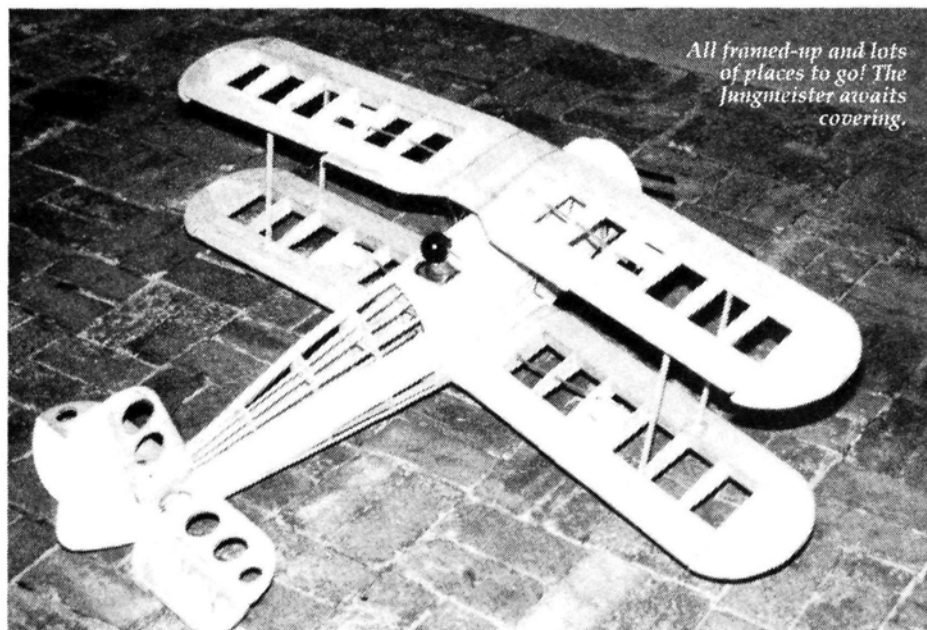
Aileron bellcrank, control rod and pushrod installation of upper wing.



.78, a Saito* 4-stroke twin .90 and the new Fox .72. I loved the sound of the 4-stroker, but I preferred the

proofreading the plans, my old buddy Dick Spencer said he could build one from what he'd seen—that's good enough for me. Just remember to fit the bottom wing and drill the mounting dowel hole before you glue the chin plate into place.

You should make up and use the temporary jig for the cabanes as shown on the plans. Without a jig, the chances of getting them straight are slim. Here's a time-saver that was developed after the plans had been drawn: make up the formers without the notches; cut them at the line at the bottom of each notch and butt-glue the stringers—it's not as pretty, but it's much quicker.



All framed-up and lots of places to go! The Jungmeister awaits covering.

JUNGMEISTER—OVER 50, AND AS SASSY AS EVER!

Who would have thought that a single-seat biplane, designed as an advanced trainer for pilots of the then-emerging Luftwaffe, would survive a half century and capture the hearts of many aerobatic airmen? Few original versions are still around, though; the 160hp Siemens radial engine is being replaced in most "flyable" examples with a high-output Continental like the one in the "smokin'" example shown here. Recently, we even heard of a 310hp, turbo-propped version that's rocketing around the skies of Florida! Guess they really *do* get better as they get older!



PHOTOS BY BUDD DAVISSON

I've mounted the cowl on this one with Velcro, which holds it nicely but allows it to break away whenever I allow a nose-over. At this time, I have no idea how long it will hold up to fuel soaking. An alternative, of course, is the use of the more conventional self-tapping screws, which can be screwed into hardwood blocks.

One last note before you fly: be *sure* you have the 1 degree of negative incidence built into the top wing. If you don't, your biplane will try to "balloon" at any time when the speed increases.

COVERING

When you're happy with the fit of the airframe parts and the control-surface functions, it's time to start covering. Final-sand the entire structure, fill any minor dings and choose your favorite covering material. All my Jungmeisters are covered with iron-on material, but you might like silk and dope. The Jungmeister will be per-

fectly happy in any type of clothing you provide!

PERFORMANCE

There's nothing unusual or difficult about taking off with a tail-dragger or flying an aircraft with two wings; there *is* something exotic about tail-dragging biplanes that turn the heads of fliers on the flight line, and the Jungmeister is definitely one of those.

Weighing 6 pounds, 8 ounces, and with a wing area of 967.4 square inches, the Jungmeister is "light on its feet." The Fox .60 provides a power-to-weight ratio that even the full-size aircraft didn't have. With an 11x7 Master Airscrew* prop, you'll have almost unlimited vertical performance; in fact, the only time you'll have that .60 screaming is when you want to go straight up.

OK; taxi out and hold some up-elevator to keep the tail wheel planted; line up into the wind; check the pattern for incoming traffic and bring the power up slowly. As you start to roll,

release some back pressure and let the tail come up. (A touch of right rudder might be needed to correct for torque.)

When the speed builds up and the wheels start to have a little daylight under them, start to ease back on the elevator stick. The throttle should be a little over half by the time you make your climb-out turn. Bring the power up to "full" and head for the "unrestricted aerobatics" area. With your goggles down, your silk scarf tight, and your shoulder harness secure, you can be Waldo Pepper, the Red Baron, or Snoopy for the next 10 minutes. Welcome back to the world of *real* flying!!

**Here are the addresses of the companies mentioned in this article:*

LJ Lind Co., 3151 Caravelle Dr., Lake Havasu City, AZ 86403.

Fox Manufacturing Co., 5305 Towson Ave., Fort Smith, AR 72901.

Saito; distributed by United Model Distributors, 301 Holbrook Dr., Wheeling, IL 60090.

Master Airscrew; manufactured by Windsor Propeller Co., 384 Tesconi Ct., Santa Rosa, CA 95401. ■

.
" ... you'll
have
almost
unlimited
vertical
performance."

GIANT STEPS

by DICK PHILLIPS

Scale sources and CG measurement

THE MONTH OF MAY marks an anniversary for me: I've now been writing columns on giant airplanes for 14 years! Those years have brought me into contact with a great bunch of people—you readers. I've met many of you, and I look forward to meeting many more of you before I retire. It's been a great 14 years, and I look forward to many more.

A LITTLE HISTORY

It's only 13 years since I first flew a Quadra engine, which set things in motion in the field of large models. Of



The Sea Fury has been modified to carry two in tandem. The plane is being fitted with controls in the rear cockpit. How'd you like to be in charge of the polishing crew for this one?

course, large models had been built before that; Sid Morgan's 1/4-scale J-3 had been around for a while. Many had been flown—some with more success than others—but on the glow engines of the day, they were somewhat under-

powered.

The Q35, with an 18x6 Punctilio prop (all that was available at the time), made a great difference. It not only enabled the Cub to fly well, but it also made a number of other airplanes capable of flight. (The Cub could take off on half throttle, and it wasn't easy to get it back onto the ground, even at idle!)

The proliferation of other engine makes and models has made it possible to fly almost anything with wings. It won't surprise me to see someone fly a large helicopter with a gas engine, and I bet someone will soon gear a gas engine to a large ducted fan! The engines being designed or converted from industrial engines are so reliable—and their quality is so good—that anything is possible!

The quality of model building has dramatically improved over the years, as

well. In the early years of the QSAA Rally in Las Vegas, NV, many of the models lacked the quality we now see there and elsewhere. IMAA and QSAA model quality is as good as that seen anywhere. National, international and specialized contests have seen the dominance of the larger model in competition. The Tournament of Champions, Canadian and U.S. Nationals and international competitions have all seen the emergence of museum-quality large models that fly well enough to take honors.

So what's ahead for larger models? A wise man once said that the past is prologue. If that's true—and I believe it is—there are some exciting times ahead for us!

As you read this, the April Toledo trade show will be in the recent past. For one reason or another,

(Continued on page 30)



This Sea Fury was photographed by the author, practically at his doorstep! The plane is in excellent condition and is flown regularly. With the wings folded, you could almost park it in your driveway!

I've missed the last few of these Expos, so I'm particularly looking forward to this year's event. In a future issue, I'll cover those items of interest to the *big* builder.

REAL AIRPLANES

There's a major benefit to living near an airport, as I do—especially if it serves a maintenance facility that specializes in slightly out-of-the-ordinary airplanes! I often walk to the shop to see what's happening (it's only 1/4 mile from my door!). In recent weeks during my walk, I've seen a Harvard

I've made some unusual additions to my documentation photos during the three years I've lived here.

For anyone interested in scale modeling, there's no such thing as "too many" pictures or items that could be of use in a documentation package. Most scale modelers I know squirrel away this sort of stuff—"just in case." This is the right way to gather documentation material. Far too many potential scale modelers build the airplane and *then* search for material with which to document it, and this is the

Ancient Modeler," Norm Rosenstock (who has been around the modeling scene *forever*) recounts his recollections of growing up in Brooklyn in the '30s and his introduction to the hobby of model building. Among Norm's friends and fellow fliers were Carl Goldberg, Bill Winter, Leon Shulman, John Winter, Sal Taibi and Joe Raspante, as well as many other pioneers in our hobby.

Norm has been collecting photographs since the early '30s, and his collection is well represented. He has designed model airplanes for himself and others for many years, and he currently has a number of 1/4-scale plans available. Norm's story is the story of modeling itself. Those of us who have been there will recognize ourselves in his stories; those who haven't will gain an understanding of where we came from. Available from ViP Publishers*, "Tales of an Ancient Modeler" costs \$14.95.

BALANCE AND TRIM

In the new flying season, many of you will take a new model to the field. It reminds me of the story of the old sergeant asking the rookie, "Where's the balance of your rifle?" The rookie answers, "Geez, Sarge, this is all they gave me!" Over the years, I've been surprised at the number of model builders who don't seem very concerned about that center-of-gravity symbol shown on most plans.

In the early days of modeling, we used to "test-glide" our models (even rubber-powered ones) before we tried to fly them. To see if they'd maintain a long, gentle glide, we'd give them a little push from about head high—usually toward tall grass. If

they wouldn't glide, we'd make adjustments until they did.

That isn't as easy to do with a model that spans 8 or 9 feet, but you should still check it before you fly it! I have a temporary setup (see sketch) that I fasten to one end of my building bench. It allows me to obtain a pretty close fore-and-aft balance before going to the field.

With a felt-tip pen (or anything else that will come off easily), I mark the approximate CG on the bottom of the wing, as accurately as possible from the location shown on the plan sheets. I then place the model on top of the balance jig with the marks on top of the doweling. (I usually try to space the legs so that they end up under a rib, rather than on unsupported covering.)

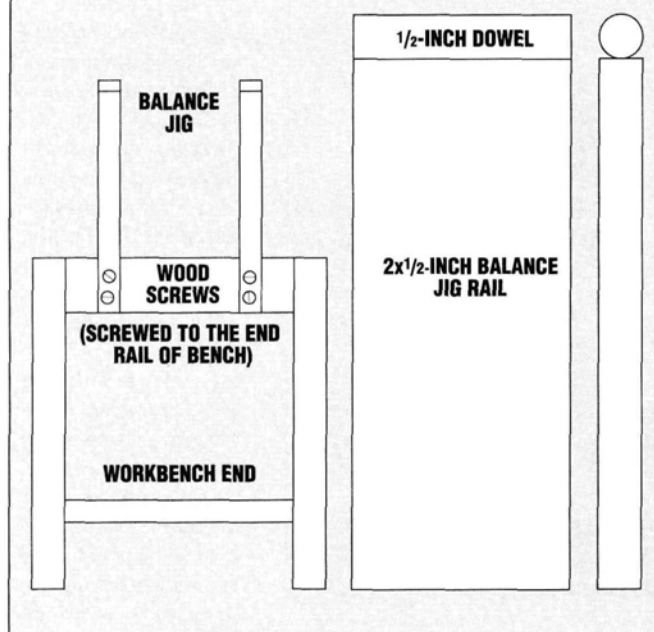
At this point, it becomes obvious whether the model is in balance or not. Ideally, while the model rests on the balance marks I've added, it should sit level with little inclination to lower its nose or its tail. Obviously, it won't sit there forever without some help, but you should be able to tell if it's anywhere near to being in balance, or if it's nose- or tail-heavy.

If you've detected that the model is out of balance, it's easy to put pieces of lead on its surface until it comes close to balancing. These lead weights are then put inside the model at the same location and glued into place.

In all my reading, I've only once seen mention of lateral balance (in an English modeling magazine),

(Continued on page 78)

DICK'S INEXPENSIVE CG-LOCATING DEVICE



(Texas) in camouflage colors, an A-26, several T-28s, a Grumman Goose and, most recently, the Sea Fury shown here. These are all flown regularly and appear at the airport when they require repair or maintenance.

You can bet that my cameras and a few rolls of film are always available to take advantage of these unannounced appearances, and

wrong way to build an accurate model! The smart builder gathers the documentation information *first*, then builds the model to suit the material.

A MODELER'S MEMOIRS

No matter when you started building models, you'll get a charge out of this book. In "Tales of an



H L / A E R O N A U T SINUS

by JOHN LUPPERGER

LET'S GET ONE THING out of the way right off the bat: as it says in Hobby Lobby's* catalog, "The name refers to a sine wave, not a cavity in one's head." I still don't know why they named it the Sinus; after all, it's a model airplane, not a ham radio!

The Sinus was designed for F3E-style flying, and it can be built in several configurations. It can be set up for 7- or 10-cell operation, with a 71- or 79-inch wingspan. Mine has a 79-inch wing and was built for 7 cells.

The Sinus is a performance ship that's definitely not for the faint of heart. The F3E is a serious event, and the Sinus is a serious aircraft. With only 465 squares in a 2-meter span, this is one slick machine! The wing root uses an Eppler 222 10-percent-thick airfoil that transitions to a semisymmetrical section at the tip. This thin wing allows the

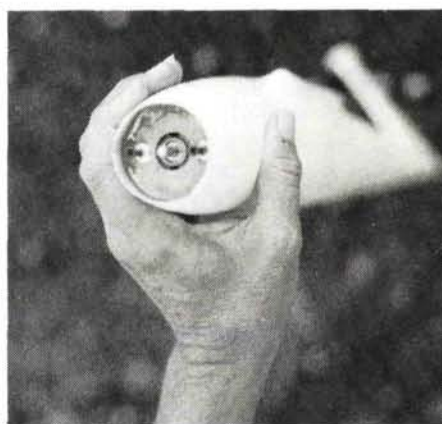
Could a sky full of these funny-named, Schuemann-winged, high-performance electrics create a new form of sinus congestion?!

Sinus to really move out. The rest of the model is just as clean: the fuselage has no hatches; the wing is faired-in; and the T-tail junction with the fuselage has fillets.

NOSING ABOUT

This package is really beautiful (as you'd expect from a high-priced import). The pre-sheeted balsa wings are packed in foam beds to protect them during shipping, and the cores looked good and smooth. The white gel coat on the fiberglass fuselage is so clean that it doesn't need finishing. A plastic wing fairing and the aileron pushrod exits are provided on one vacu-formed sheet, and all the small parts are grouped and bagged.

The horizontal tail surfaces were the only disappointing part of the kit. The die-cutting on this 1/4-inch



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Type: F3E electric sailplane
Span: 79 inches
Weight: 42 to 67 ounces
Length: 38 inches
Wing Area: 465 square inches
Wing Loading: 13.0 to 20.7 ounces per square foot
Airfoil: Eppler 222
No. of Channels: Reg'd: 3 to 4 (motor control/elevator/aileron/optional aileron spoilers)
Sug. Retail Price: \$339.95
Features: Clean design, high-quality kit, easy-to-follow plans, quick construction. This model can be built in several configurations.
Comments: Despite its funny name, the Sinus is a serious aircraft. It can outclimb the competition, and if lift is available, it performs pretty well, too.

• • • • •

Two socket-head bolts hold the Astro FAI 05 in place on the oak plywood. Plenty of epoxy is used to ensure that the fire wall stays put.



Our author (right) lent flying buddy Dieter Lamprecht his back-up Sinus. This wasn't a particularly sound move, as Dieter beat him at the competition!

balsa sheet could be referred to as "die-crushing"! The plans are clear and easy to read, and the instruction booklet includes 10 construction photos. The assembly sequence is repeated in five languages (luckily, one of them is English).

FOLLOW YOUR NOSE

There's nothing unusual here; construction is fairly rapid owing to the high degree of prefabrication. The first step is to install the plywood fire wall. (All the plywood in the Sinus kit appears to be oak, which is an extremely strong, hard wood.) I mounted the motor to the fire wall with two screws, slid it

into the fuselage and attached the prop to the motor shaft to help align everything with the front of the fuselage. Then, I epoxied the fire wall securely in place.

The plywood elevator servo tray must be fitted with the servo and switch harness and epoxied into the rear of the wing opening in the fuselage. The elevator pushrod sheath (which is pre-mounted in the rear of the fuselage) is then securely glued to the fuselage side so that it lines up with the servo arm. Cut off the excess sheath at the rear

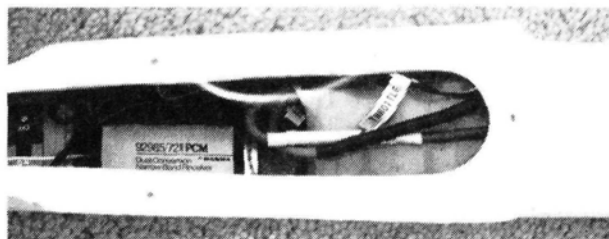
and save it for later.

The horizontal stab is built up from four pieces: the main body, the tips, the plywood bolt hold-down and the tapered elevator. All these parts (except the elevator) are glued together and sanded to a symmetrical section. Cut a small notch off-



center on the elevator trailing edge; the leftover pushrod sheath is glued into this slot. This "elevator horn" is then glassed over for strength. Bend the elevator pushrod (fine music wire) and insert it in the tube. Finally, drill a hole in the plywood for the single bolt that holds the entire assembly onto the top of the vertical fin.

Each wing has a groove in the leading edge of the core to accept the aileron servo extension wires. The leading edges are glued on, permanently sealing in the extensions. As reinforcement for the wing bolts, a hardwood block is glued into place near the rear of the wing at the root. The wing tips are glued on and rough-shaped; the ailerons are cut free from



Radio gear is a tight fit, especially when a 1200mAh flight battery is used. In Europe, the Sinus is flown as a 10-cell. I can't figure out how they get the additional three cells in there!

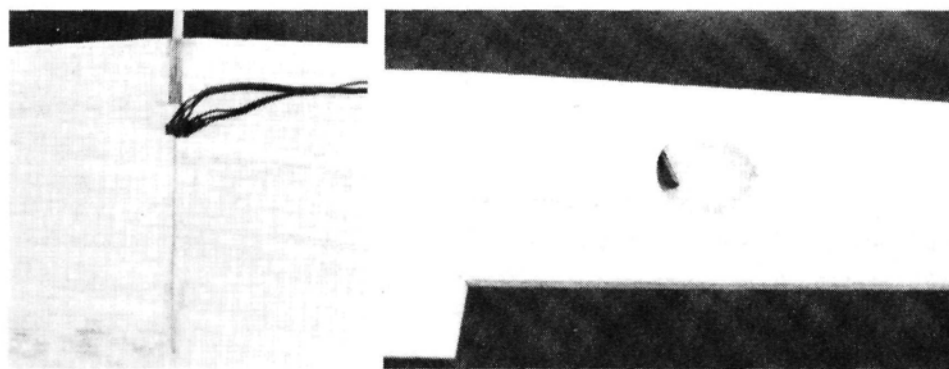
drilled at the front of the wing opening for the wing hold-down dowel. Two pieces of dowel (for the wing hold-down screws) are then inserted into these pre-drilled and -tapped holes. Press the wing down on the dowels to mark it for drilling. You'll need a counter-sinking drill to finish the holes, as the wing "bolts" are flat-headed.

Before mounting the 501 servos in the wing, I coated the balsa in the servo cutout with epoxy. This provided a

Oracover iron-on film. This material is especially good for covering sheeted surfaces. (See sidebar.) I finished it in overall white, with the bottom of the wing and the stab tips painted fluorescent red and the tops fluorescent yellow. I sealed the aileron servo compartments in the wing with wide, white 3M tape. The servos are slightly thicker than the wing, and the tape not only seals the compartment, but it also helps cut down on drag.

For initial flights, I used an Astro* FAI 6-turn 05, a 7-cell 900 and a KW 8x6 fiberglass folding prop. On later flights, I used a Hobby Lobby Ultra 800 motor, a 7-cell 1200mAh battery pack, a Freudenthaler 9.5x5 folding prop or a KW 9x6 folder. With everything positioned according to the plans, the model balanced without the addition of ballast.

I used an Airtronics* Vision PCM 8SP radio with two 501 microserves (one on each aileron), one 401 miniservo (on the elevator), an 8-channel PCM receiver, a 250mAh airborne battery and a Novak* NESCT-1X electronic speed control. I used the mixing capabilities of the Vision to set up the ailerons as air-brake spoilers. They deflect vertically approximately 70 degrees and work much like spoilers, but with-



Left: Wing center section before glass tape is applied. A hardwood dowel is epoxied into the slotted plywood partial rib. The aileron extensions exit the wing at this point. Right: A servo-extension plug can be seen in the aileron cutout. Airtronics' 501 microserves were slightly thicker than the wing section in this opening.

the wing and faced with balsa; and the wings are then joined with epoxy at a dihedral angle of 5 degrees. Cut a slot for the plywood partial rib that houses the wing front hold-down dowel, which is epoxied into place, then glass the center of the wing with the supplied tape.

Next, the fuselage is

smooth surface on which to attach the servo tape (use the thin type used by R/C car racers). Now, it's simply a matter of lining up the pushrods with the horns and pressing the servos into place. Remember to finish-sand all surfaces before covering.

I covered my entire model with Hobby Lobby's new

out the pitch-down motion.

NOSING UP

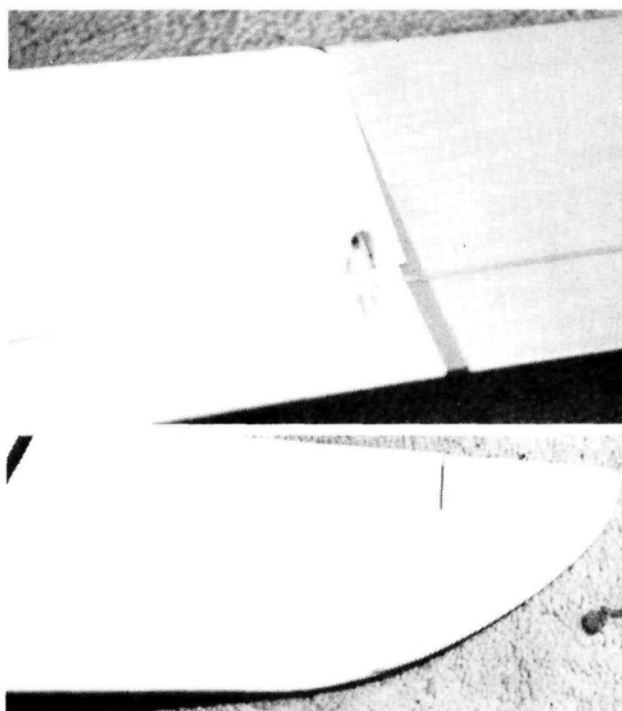
I managed to finish the model a couple of days before the Harbor Soaring Society's F3E 7-cell event, and I was nervous about getting it in the air. With the 900mAh pack, the model weighed a rather hefty 53 ounces—more than any 7-cell model I'd ever owned! I was apprehensive about whether a 7-cell system could fly the Sinus at that weight, but I didn't take into account the power of the Astro FAI motor, or the plane's clean, efficient design.

When it was time for the first flight, I advanced the throttle on the Novak speed

control and threw the Sinus hard. What a surprise! It took off like the proverbial scalded cat. I eased in a touch of up-elevator, and away it went. In about 30 seconds, the Sinus was at the same altitude that most thermal duration competition 7-cell ships would take 40 seconds to reach!

My second surprise came when the Sinus made contact

(Continued on page 81)



Top: Pushrod fairings reduce drag and protect the servo arm from damage. Tape covers the aileron recess in the wing. Bottom: The wing's distinctive curved tip makes it look as if it's moving even when it's sitting on the ground.

YOU'RE PROBABLY SAYING to yourself, "Another new covering—so what!" Well, there's reason to get excited: Oracover is different. It's very strong; it goes on with low heat; it can be used on open or sheeted structures; and it won't wrinkle when left in a hot car!

I've used Oracover on five models, and it has become one of my favorite covering materials. On fully sheeted surfaces, it's the easiest material to apply that I've ever used. The glue is activated at a temperature below that at which the polyester film starts to shrink, and this means that you can iron the material down from one end, and it won't wrinkle or pucker as you

go along. You get even adherence without any creases or loose areas caused by trapped air. If you *do* have wrinkles after ironing the material down, just increase the iron temperature and go over it again to get rid of them.

Open structures are done in the same way. Iron down the material wherever it touches the wood (this results in a stronger finished model). Then, to remove wrinkles and shrink the material drum-tight, increase the iron temperature and pass over all the open areas. Although use of a heat gun isn't recommended, you can use one to help remove stubborn wrinkles if you're careful not to heat the adhesive to the point

that it comes unglued. (This can also be used to your advantage. If you want to move a section that's already adhered, simply heat it up with the gun, pull it free and reapply it with the iron.)

Oracover also works well on curved surfaces, e.g., nose blocks or wing tips. Because it can be stretched while being heated, it can be pulled easily around surfaces when it's being applied. As it cools, it shrinks and leaves no wrinkles.

I crashed a 2-meter sailplane covered with Oracover, and the wing snapped in half. I challenged the other competitors to try to puncture the covering in the open bays by hitting it with an ex-

tended finger. Many people tried, and many were impressed; no one was able to break through the Oracover! Even though the wing was broken beyond repair, I believe the rest of the model was in such good condition owing to the covering. Since it has such great strength and is ironed to the structure, this "laminating" process helped prevent greater damage.

Oracover is available in 21 colors, and it has a nice semi-gloss sheen, instead of the high-gloss plastic look of most materials. This gives models a "painted" appearance. If you want more information about Oracover, contact its importer, Hobby Lobby International.

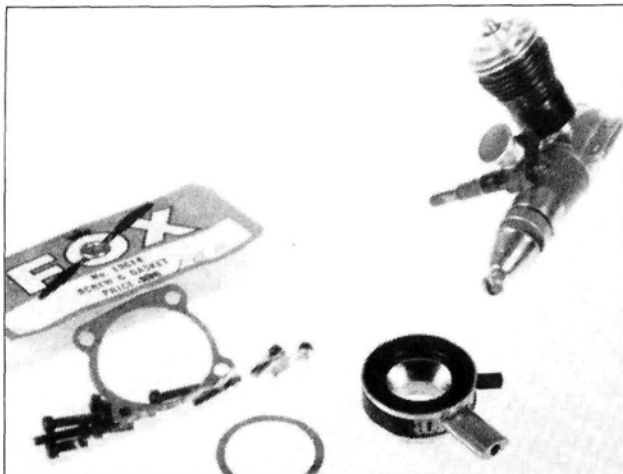
HOW TO:

by RANDY RANDOLPH

MUFFLER PRESSURE FOR THE .049

A step toward more stable needle-valve settings

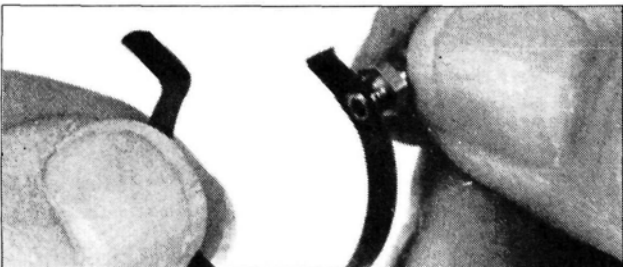
There are times when the tank in small airplanes isn't in the best place for good fuel flow to the engine, or when an external tank is desired for a reed-valve engine. In these cases, muffler pressure to the tank would greatly improve fuel flow to the engine. Although the TD .049 is shown, the procedure works for all Cox .049 engines with the standard muffler.



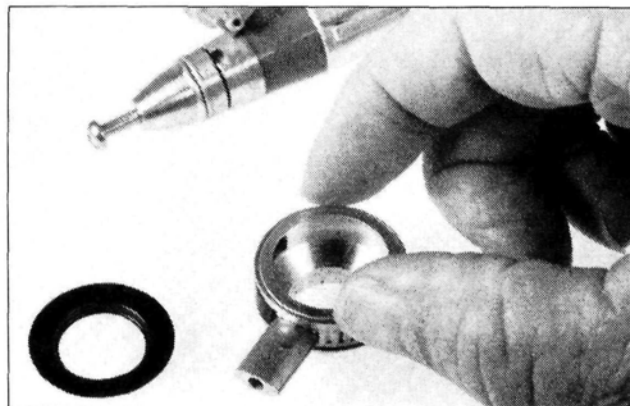
1. A good muffler seal is essential to the performance of the pressure tap. Fox Screw and Gasket package no. 13614 contains a metal ring that helps provide that seal.



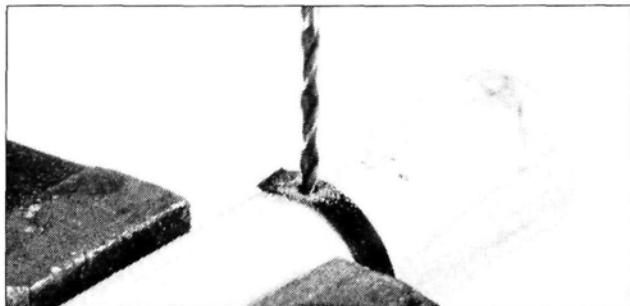
3. Replace the top of the muffler and re-install the modified muffler on the engine. The muffler will now have a tight fit with the engine.



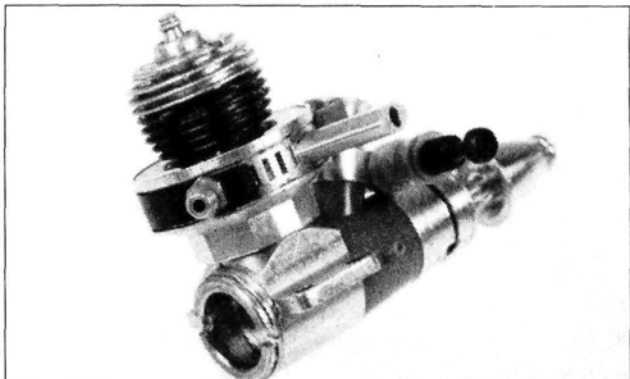
5. Twist the pressure tap into the hole. It may be necessary to ream the hole slightly before it will receive the tap. Re-install the cover on the muffler so that the tap is over the priming port.



2. Lift the top off the muffler body and lay the ring from the Fox package on top of the body. It's a nearly perfect fit.



4. Remove the sliding priming-port cover from the muffler and drill a $\frac{3}{32}$ -inch hole approximately $\frac{1}{4}$ inch from the open end. A 1-inch dowel or broomstick is helpful in holding this assembly for drilling this hard material.



6. The result is muffler pressure and a smoother engine run. Thanks to John Gill of the Dallas R/C Club for this modification.



Just as we
thought:
the second
time around,
smaller is
getting
bigger!

Left: Tom Blakney's little biplane amphib was a Cox TD .02-powered Pool Boy, which was inspired by Ken Willard. Below: Tony White flew his T-tail, which was almost a flying wing. Powered by a Cox .049, its performance was impressive. Tony is Ted White's son, as well as his flight instructor.



by RANDY RANDOLPH

2 N D A N N U A L

SMALL STEPS FLY-IN



World-famous Jim Simpson's planes ran the gamut—from the smallest to (almost) the largest. The O.S. 25 ESR in this Delta Hustler was 25 times bigger than the .01 in his Pup!

THE WIND DIDN'T blow over 11mph in Dallas, TX, on November 14 and 15, 1989, so conditions were almost perfect for the 2nd Annual Small Steps Fly-In sponsored by MAN, the Dallas R/C Club and SMALL (the Small Model Airplane Lovers' League).

There were flying wings of all sorts—twin electrics, glows, deltas—even a scale B-2 Stealth Bomber! How about a CO₂-powered air-

plane called "Casper" because it uses an old galloping-ghost radio, a full-house G-Mark .035, an .02-powered CAP 21, or a Pup with an .01 up front?! Then, there were the "big" .25-size P-51s—a whole squadron of them! No other people in our hobby/sport are as creative as the builders of small airplanes!

With so many outstanding models filling the sky,

to say that one was the hit of the show takes some doing, but it's true. The star was Paul Willenborg's little Fantrainer, which was presented as a construction article in the January MAN.

Paul's airplane appeared to be as good as the very best ducted fan, regardless of power. On both days, a line of people



Tom Day used Black Baron Presto to add the two of hearts to his good-looking, nice-flying .049 twin. (Steve Hart is Tom's flying buddy.) Wonder who thought of the trim for Tom's plane?



Steve Staples (also of Little Rock) salvaged his Air Scout by adding a Rogallo wing. This easy-to-control, flex-wing airplane flew at the same speed, climbing or diving!



Emmett Fry's attractive, Enya .15-powered FW Stosser was test-flown at the Fly-In. In spite of all the heckling, it went home (to Little Rock, AR) in one piece!

waited to fly it, and even Paul had to wait his turn! All day long, that poor airplane did rolling 360s, multi-point rolls, knife-edge flight, snaps and

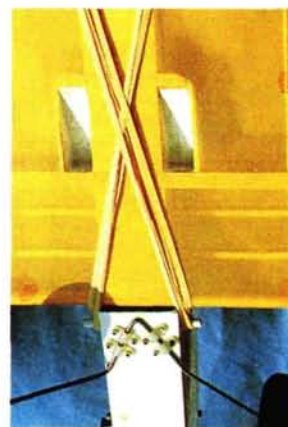
spins—all with instant recovery. Even when the TD .049 was throttled all the way down, it still wanted to fly!

Dozens of other airplanes were almost as popular. Nearly all the modelers who attended would hand over the controls of their

unique and beautiful airplanes to almost anyone who asked; that's a testament to the high caliber of the people who build and fly these small planes!

Another thing that makes these fly-ins special is that two qualified instructors are on the field at all times. Anyone who feels a little insecure can have a top-notch teacher at his shoulder until the jitters pass. The idea is to have fun without pressure, and it's a real help to know that a back-up is at hand.

This year's 3rd Annual has already been set for October 13 and 14 at the same place—the Dallas R/C Club Field in Seagoville, TX. Be there!



Because it's difficult to hand-launch low-wings, Steve added "hand holds" to the bottom of his Two By Low. That's a heck of a good idea!

The MAKING of...

"ALWAYS"

by GEORGE MILLER

AS A MODEL builder and a self-proclaimed aviation historian, I like to go to movies that feature aircraft and to see if I can spot the models. Of course, looking for inaccurate depictions is part of it. No matter how good the movie, we all know that certain scenes demand the use of models; some full-scale aircraft are simply unavailable, or no longer exist. We modelers enjoy movies that involve aircraft even more than most non-modelers, because we appreciate the difficulty of making models look and act like the real thing. The wizardry of the movie industry is something you really have to see to appreciate!



Can you believe this is the inside of a building, and that it's not a real forest, or a real plane?? Note the rig on which the aircraft is suspended.



Models in the movies make an Oscar hopeful!



Super Catalinas in 1/5 scale. ILM is the special-effects company owned by George Lucas Films, and it's

I'll describe the building, the test-flying and the indoor "night" filming of the B-26C Invaders, followed by the building of the PBV and the location work. This truly is a step towards advancing the awareness of R/C: every time we have a chance to demonstrate to the public that R/C is about more than just toys, it benefits us all.

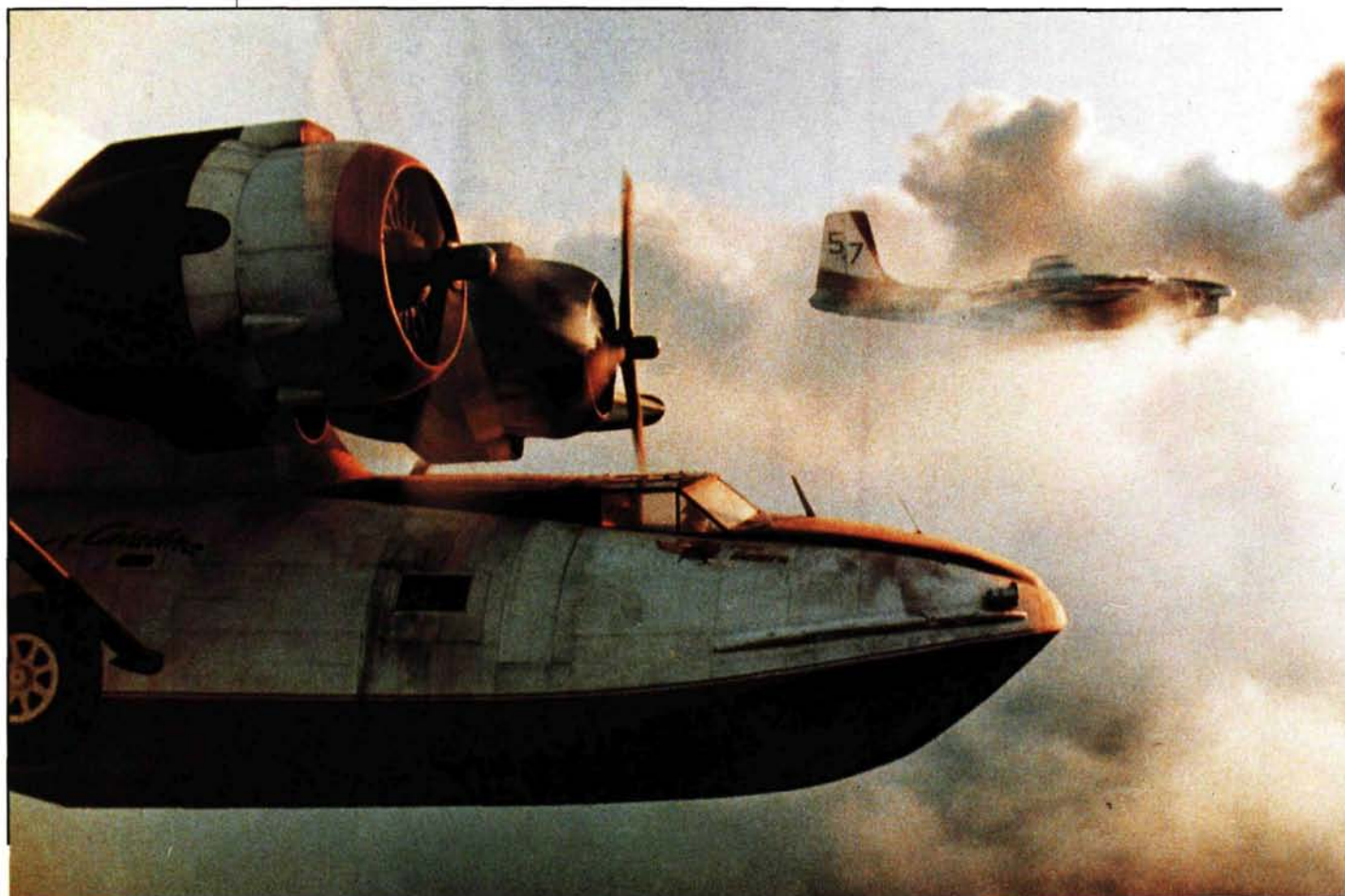
INVADED!

It started with a phone call from Mike Fulmer, the model supervisor for ILM, who quickly became a very good friend. Mike asked me if I could scratch-build 1/5-scale B-26 Invaders and how long it would take. A week later, he brought the producer and director to my

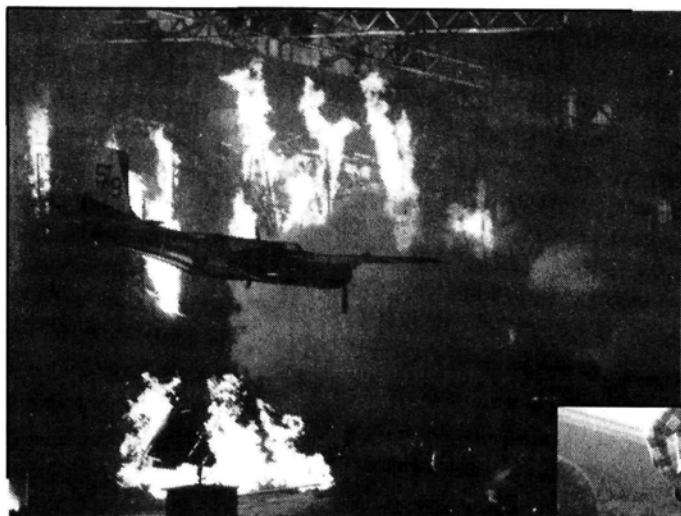
I spent half of 1989 making and working with the model aircraft used in Steven Spielberg's movie "Always." My company, Custom R/C Aircraft*, was contracted by Industrial Light and Magic (ILM) to build six Douglas B-26C Invaders and two PBV

responsible for the special effects in many of the biggest films ever made.

This was a considerable project for a major film company. Because of the complexity and diversity of the activities involved, I'll divide my story into several articles.



PHOTOS BY GEORGE MILLER & ILM



"ALWAYS"

shop. They looked at my planes and asked questions; a month later, I received the go-ahead.

I was now in the business of manufacturing some very big models! Construction of our ducted-fan kits screeched to an immediate halt. We had six Invaders and two PBYS to build—and four months in which to do it! The models would represent the Borate Bombers flown by the "Fire Eaters" of Montana. ILM supplied us with the documentation and videotapes of the aircraft in action.

To put this project into perspective: a 1/5-scale Invader has a wingspan of 14 feet and a length of 10 feet, 3 inches. The aircraft would have full controls, flaps, retracts, operating doors on the borate tanks and the ability to actually drop borate. The scale details include: dummy radial engines; scale landing gear; complete cockpit (including pilots that look like the actors); navi, strobe, landing and search lights; and illuminated instrument panels. Four to eight men worked 10 to 16 hours each day—frequently, seven days a week!

I scaled-up a three-view from a Squadron Signal Pub-

lication and started on the plugs for the fuselage and the cowls. The fuselage plug was made of door skin and foam, carved to shape and glassed with epoxy resin; the plug for the cowls was turned on a lathe and finished in a similar way. Female molds were made of fiberglass, using a chopper gun to achieve the required thickness. Nine-ounce glasscloth was used to produce the finished parts.

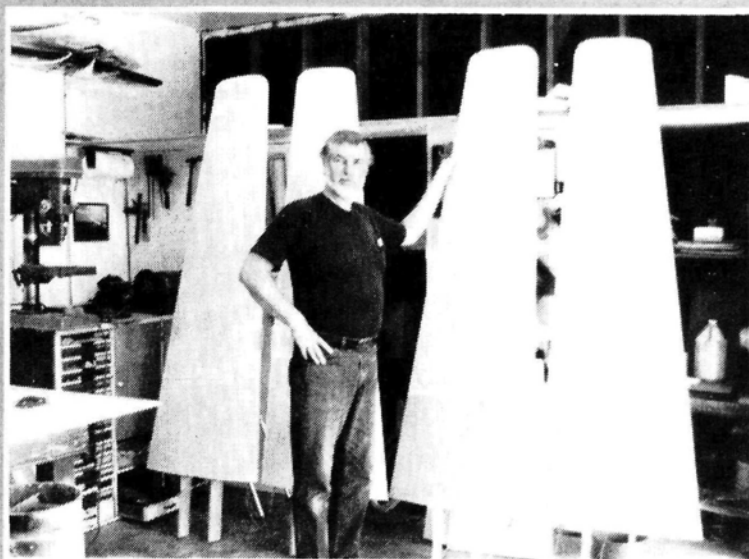
The flying surfaces are cut foam cores sheeted with 1/64-inch ply. We used 3/8-inch marine ply for the wing spars and 1/4-inch ply for the tail spars. The wing spars in the right wing were offset relative to the spars in the left wing; this allowed them to sandwich



the main fuselage formers, to which they were plugged and bolted. This system worked very well and allowed the aircraft to be broken down into manageable sections.

For power, we used Sachs-Dolmar 4.2 engines from A&M Aircraft*. No one at Custom R/C Aircraft was ex-

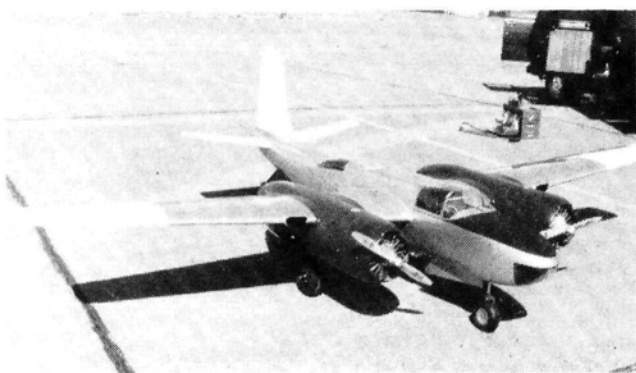
Above: This is how an Invader looks when something goes wrong: when one breaks, they all break. Because of its construction and the ease with which it could be disassembled, it was repaired very quickly. This was something ILM didn't expect!



Foam cores for first two B-26 Invaders are sheeted with 1/64-inch ply and ready for aileron and flap installation.



After preparing their surfaces, detailing (including panel lines and weathering) was accomplished on each model.



Above: Completed no. 2 on the day of the first test flight. Rest of finish was completed after the models had been test-flown.

perienced at setting up these large gas engines or had ever even run one, but Al of A&M took us under his wing and ensured our success. This man's help was immeasurable. The shooting schedule was never delayed because of one of our aircraft!

Retracts for planes of this size were another story. We

finally settled on some commercially available giant-scale units that seemed as if they'd work. Although we were assured that these would handle an 85-pound aircraft, they didn't do the job. We had to design a set of mechanics and have them fabricated in ILM's machine shop. It was the same story with the scale gear struts. (Incidentally, A&M now manufactures these retracts; if you're building a giant-scale aircraft, these have been proven in the field.)

To operate the aircraft, we chose Airtronics' new Vision radio. I've been using Airtronics radios for some time, and they've worked so well for me that I wouldn't consider any other. For actuators, we used Condor* giant-scale servos. These 200-ounce torque units also have giant-scale servo arms, the requirement for which we learned about the hard way, as I'll explain later.

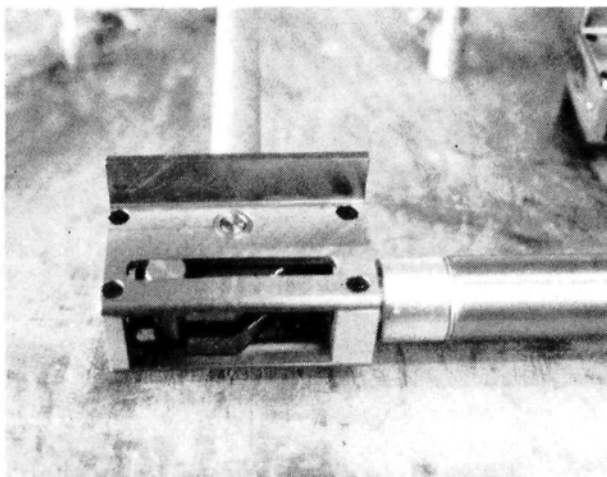
As we completed each Invader, we took it to ILM where the final paint, markings and weathering were applied. The first one was to be used statically for filming scenes of fighting forest fires at night, so it wouldn't be a

flying model. Believe it or not, all the "night flying" was done indoors! The other five Invaders were given the basic colors at our shop, test-flown at Hamilton Air Force Base and then brought into the ILM shop for the addition of details.

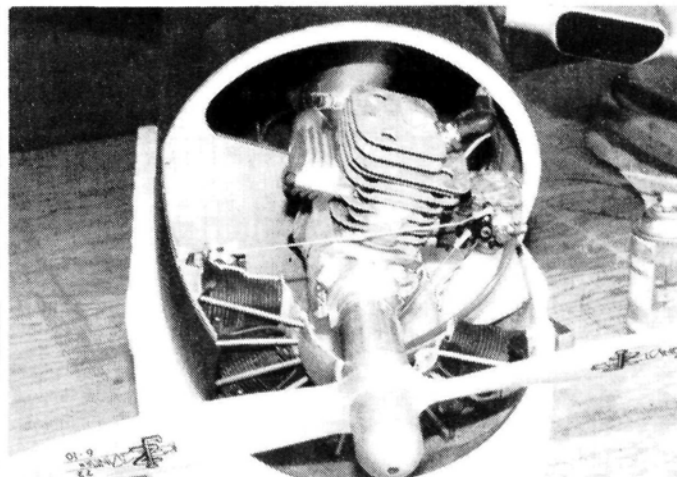
INSTANT SUCCESS!

One bright, sunny morning in June, we drove out to the air base to assemble our second B-26C Invader for its test flight. We spent most of the morning testing, running engines, checking and rechecking everything. The tension and excitement were higher than an SR-71's operating altitude! I'd never designed an aircraft of this size before, and none of us had ever built or flown one.

We'd run out of excuses and things to check, so we positioned two video cameras and taxied to our "active." We lined up on the runway and advanced the throttles. We estimated how long the takeoff roll would be and positioned a video camera at that point. The aircraft accelerated to takeoff speed, rotated and climbed to about 200 feet by the time it went over the cameraman's head!



Landing-gear unit designed by the author and built by an ILM machinist.



Installation of the engine in the second B-26C. The two-blade props were used for testing and flying when they wouldn't be noticeable. Twenty-four-ounce tanks provided a 15-minute flight time with a 5-minute safety margin for getting back on the ground.

It flew like a trainer! We couldn't have asked for more.

After about 10 minutes of just flying around, we landed and brought our first flying B-26C Invader to ILM. We were a very happy group. It had flown just as well as we had hoped, showed no vices and looked absolutely awesome in the air—and we were even on schedule!

HANGIN' OUT!

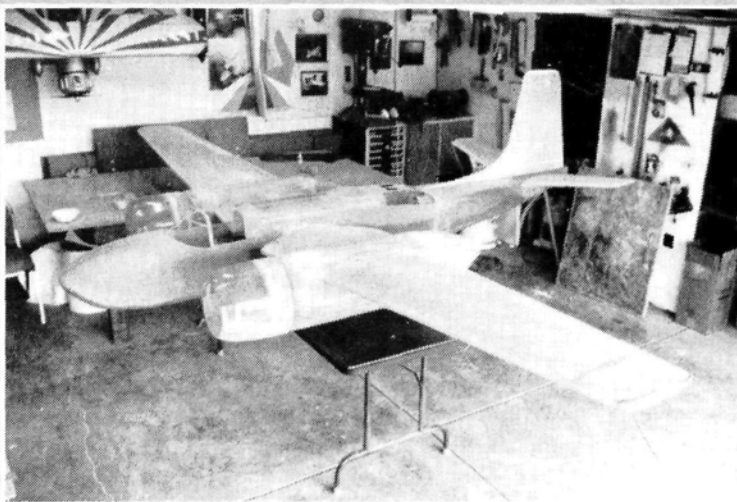
The first completed B-26 (the static version) was to be used indoors for the night work, and it's called a "wire hanger." It has hard points on its wings, fuselage and tail, to which suspension wires are attached. It also has aluminum collars, which are mounted on formers in the fuselage. A removable cap at the end of the fuselage enables a long, aluminum beam to be slid into the fuselage to allow the aircraft to be mounted on a vehicle or whatever mechanical device was required. This is referred to as "boom mounting."

Rather than having R/C engines in the cowl, the static model has stripped-down Sullivan* electric starters, which turn aluminum props. The props have no

pitch, so they look like turning props, but they don't pull the aircraft while it's suspended on wires.

To film the plane "flying" through a forest indoors requires a very large building. ILM used the Bethlehem Steel Plant in San Francisco. It's approximately 300 feet wide, 700 feet long and has a 70-foot ceiling. Inside, a 1/5-scale forest was built using trees that had been treated with a fire retardant, steel pipes that looked like burnt trunks, and everything else you can imagine it takes to create a fake forest that can be burned repeatedly for numerous "takes." The "forest" was made in modules that could be rearranged to create different scenes. Add wind and smoke machines and a variety of other paraphernalia, and the illusion becomes uncanny!

Attached to the ceiling was



Above: The first Invader assembled, ready for the fillets for the nacelles, wings and tail. All flying surfaces are removable for easy adjustment and transportation.

a track that ran the length of the building and included a traveling rig on which the plane was suspended. This rig was computer-operated, and the aircraft could be raised, lowered, banked and put into virtually any flight maneuver.

This tremendous effort was accomplished by ILM, and the resulting shots are some of the most impressive special effects I've ever seen. To be able to simulate aircraft flying through a forest fire at night, inside a building, and make them look real, is absolutely remarkable. They don't call Industrial Light and Magic the best special-effects company for nothing! As you can imagine, building the aircraft used for these shots was a real thrill.

In my next article, I'll describe the construction of the PBY and take you on location while we do the R/C flying of our "Fire Eaters."

These B-26C Invaders are available in kit form. If you're interested, I recommend that you call; I rarely find time to sit down and write letters!

**Here are the addresses of the companies mentioned in this article:*
Custom R/C Aircraft, 1140 Civic Center Dr., Rohnert Park, CA 94928.
A&M Aircraft Supply, 1428 McArthur, Suite 102, Carrollton, TX 75007.
Airtronics Inc., 11 Autry, Irvine, CA 92718.
Condor Servos, 1733 Monrovia Ave., Costa Mesa, CA 92627.
Sullivan Products, 1 North Haven St., North Haven, CT 06460.



Foam plug for engine nacelle and cowl, completed and ready to be epoxied. Also on the table are a dummy radial engine, Sachs-Dolmar 4.2 with CD ignition, three-blade flying prop and muffler.

PUSHING A POWERHOUSE PAST ITS LIMIT

OPS.80 FAN

SOME OF THE most bracing tasks undertaken for this column are tests on the increasingly "high-profile" engines that have been designed specifically for ducted-fan, 2-stroke applications.

Producing performance at the top end of off-the-shelf products' limits, but within the space and weight constraints commonly associated with 10cc engines, means that dynamometer tests give the sense of being at the limit of what's possible.

High rpm increase the efficiency of the small-diameter ducted-fan impellers employed, while any weight reduction helps to achieve the desirable high thrust-to-weight ratio. High rpm are usually derived from higher hp levels, which, in turn, produce yet more fan thrust, so the reasons for the existence of this prestigious class of *light-weight* racing

2-stroke engines are clear (no fear here that the 4-stroke will find yet another niche). When these new high-performance powerplants are attached to the equally new-generation fan units like Dynamax and Viojett, spectacular flying performances are commonplace.

MECHANICAL DETAILS

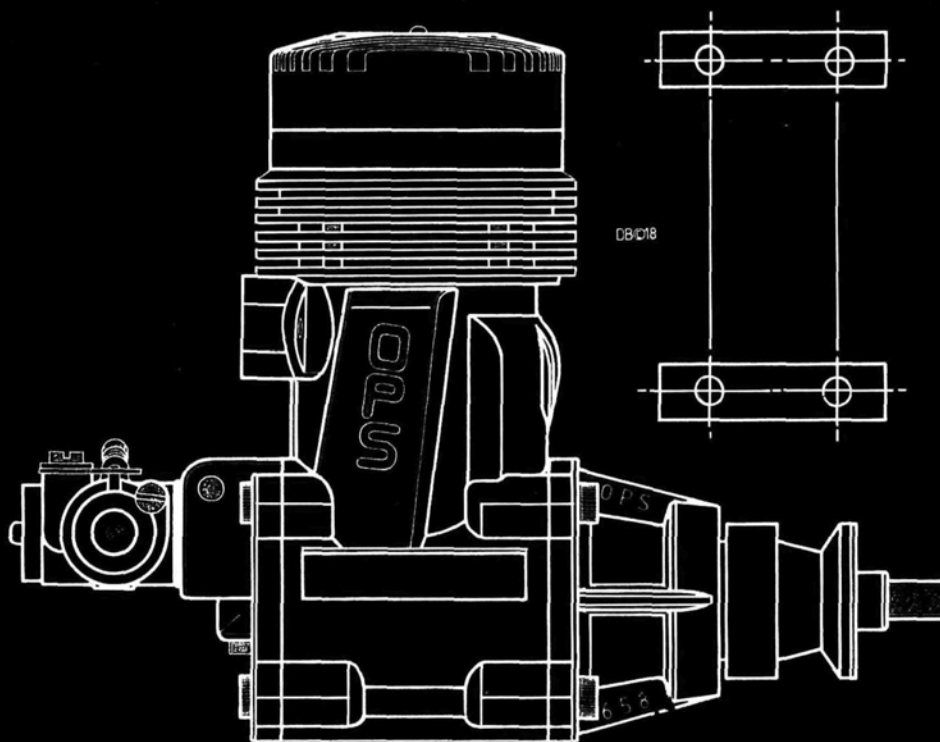
The OPS 80 Super is a fine example of latest trends in the ducted-fan class. It features the five-port-style of Schnuerle porting (three front boost and two side transfers), a rear-induction disc, an ABC ringless piston/liner combination, a tuned pipe and an optional combustion chamber for high-nitro use. All this leads to a claimed 4.55hp on 50-percent nitro using a non-muffled tuned pipe.

Using the same five-port aluminum-alloy crankcase as the 65 Speed Super, OPS has probably reached the limit by boring out .107 inch to obtain a bore of 1.063 inches. As stroke is unchanged at .905 inch, the result is an "over-square" short-stroke engine. Despite the resultant extra space, overall weight is increased by 2½ ounces.

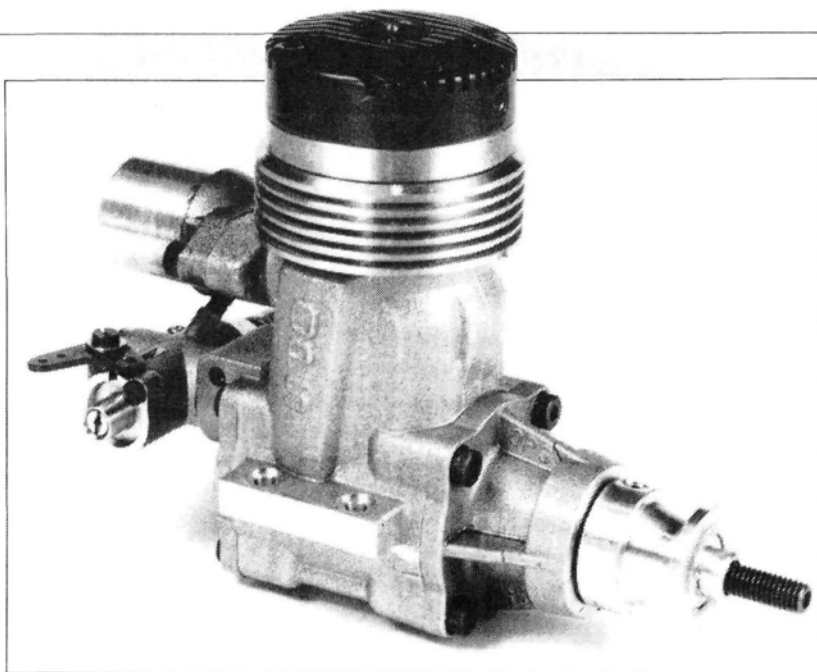
The hardened-steel crankshaft has a tungsten counterbalancing slug pressed into the web to increase over-balancing against the rod and piston. This feature is being used increasingly by Italian racing engine manufacturers, and it reflects an apparent inability to obtain sufficient balance from sensibly cutting away the web cheeks, while keeping the crank-web diameter small enough to give good crank-cast pumping (the bigger the web, the larger the volume of the lower crankcase opening—and, usually, the more inferior the pumping).

The piston is solidly cast in the usual high-silicone al-

SPECIFICATIONS



(Approximately 80% of full size)



Italian racing engine technology maintains its superiority; the OPS 80 is a typical example. Cooling fins are left deliberately large to cope with the "big-engine-inside-a-small-case" problem.

loy, and it runs in a brass-chrome liner with 172-degree exhaust timing. This gives an acceptable 22-degree blow-down timing period ahead of transfer opening, for a meaningful tuned-pipe response (the smaller the blow-down, the less time needed for acoustic wave propagation, and, thus, the less effective is the pipe's response).

The solid machined-alloy connecting rod is bushed only

at the crankpin and has three lubrication holes, one of which is strategically placed to benefit from incoming fuel/air. (OPS can provide an optional roller-bearing rod and a matching crankshaft for anyone who would feel happier beyond the twilight zone of 25,000rpm.)

The standard, rear, induction disc is of hardened steel. OPS hasn't resorted to a drum rotary valve or a Zimmerman disc to deal with the rotary disc's occasional inability to rotate much faster than 25,000rpm without having mechanical problems. As the disc is provided with two alternative driving slots, the carburetor can be moved either to the top or the bottom entry position in the rear cover.

The engine's actual disc timing is noteworthy: the large total period is 211 degrees, but more striking is the late

Capacity	8005 cubic inch (13.1178cc)
Bore	1.063 inch (27mm nominal)
Stroke	.902 inch (22.9mm)
Stroke/Bore ratio	.848/1
Timing Periods	Exhaust: 172° Transfer: 130° Boost: 128° (angled up 50°) Blow-down: 22° Rear Induction: Opens: 40° ABDC Closes: 71° ATDC Total Period: 211°

Combustion volume	1.2cc (high comp/low nitro)
Compression ratios	Geometric: 11.9:1 Effective: 7.58:1

Exhaust-port height	.358 inch (9.09mm)
Cylinder-head squish	.028 inch (.71mm)
Cylinder-head squish angle	7°
Squish-band width	.20 inch (5.1mm)
Carburetor bore	.400 inch (10.2mm)
Crankshaft diameter	.499 inch (12.68mm)
Crankpin diameter	.2745 inch (7mm)
Crankshaft nose thread	6x1mm (separable stud)
Wrist-pin diameter	.236 inch (6mm)
Connecting-rod centers	40.6mm
Engine Height	4.32 inches (109.7mm)
Width	2.366 inches (60.1mm)
Length	5.16 inches (131.1mm)
Width between bearers	1.7 inches (43.2mm)
Mounting-hole dimensions	20x51x4mm
Frontal area	7.9 square inches
Weight (overall)	21.7 ounces (614g)

Performance:

Max. BHP

3.98 @ 18,900rpm	(OPS pipe at 305mm/5% nitro)
2.64 @ 17,100rpm	(open exhaust/5% nitro)

Max. Torque

208 oz/in @ 18,300rpm	(OPS pipe at 305mm/5% nitro)
182 oz/in @ 12,800rpm	(open exhaust/5% nitro)

RPM on standard (fixed-wing) propellers:

	Open Exhaust	Tuned Pipe
13x6 MK	12,644	—
12x6 Graupner	14,678	—
11x7 Master	15,600	15,900
11x6 Graupner	16,368	—
10x6 MK	17,200	—
9x6 Master	20,020	22,200

Performance Equivalents:

BHP/cubic-inch	4.97
BHP/cc	.30
Ounce-inch/cubic-inch	259.8
Ounce-inch/cc	15.85
Gram-meter/cc	11.28
BHP/pound	2.93
BHP/kilo	6.48
BHP/square-inch frontal area	.503

Distributor:

Shamrock Competition Imports
P.O. Box 26247
New Orleans, LA 70186

Manufacturer:

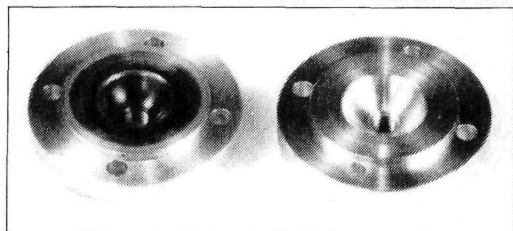
OPS Engines
Monza, Italy

OPS.80 FAN

closing point of 71 degrees ATDC. This recognizes and utilizes the considerable gas inertia at high rpm and so maximizes gas flow—but only at high rpm. Conversely, lower rpm performance is degraded by this, but this shouldn't concern most fan operators.

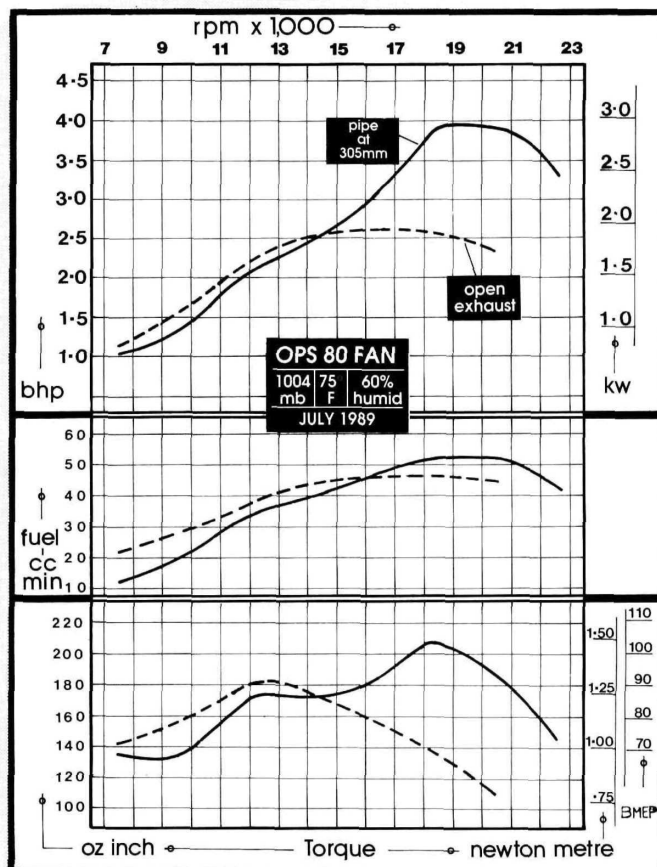
The carburetor is OPS's slide-valve design, which has main and secondary needles and is operated by a right-angle bellcrank. To prevent leaking and excessive movement under vibration, O-ring seals are used at critical points. The omission of an "in-flight" fuel-mixture control is slightly surprising because it always seems a good device for a tuned-pipe engine. After all, OPS does provide a very good one for its marine engines, and it would be just as useful in preventing dangerous in-flight "over-leanness" of the fuel mixture.

The two-part cylinder head has a combustion-chamber section that's clamped between the head and the crank-



High-compression/low-nitro combustion chamber used on test is on left. (Low-compression/high-nitro chamber wasn't tested, as it's unlikely that this configuration would be used in DF application.)

case. Two chamber sizes are available—1.2cc overall volume for low- or no-nitro fuels, and 1.4cc volume for 45- to 55-percent nitro use. These give effective compression ratios of 7.6:1 and 6.6:1, respectively (low figures, both

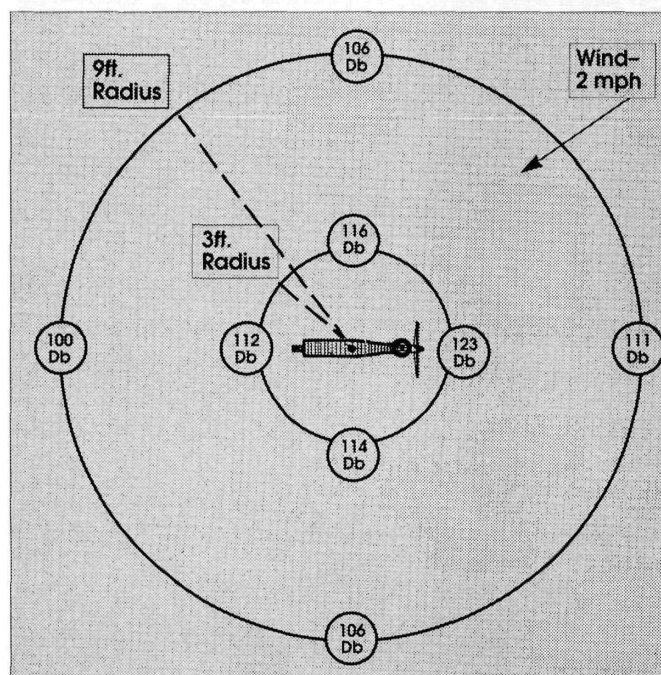


showing that a really effective tuned-pipe supercharging effect will be obtained).

Functionally, this fan engine can be converted to marine use by rotating the crankcase.

PERFORMANCE

A variety of propellers was rpm-tested during the first runs in open-exhaust form, though finding a propeller that would give the OPS 80 its head above 20,000rpm was a



SOUND LEVELS - dB

Equipment: OPS quiet pipe @ 305mm

Fuel: 5% nitro

Engine position: 3 feet above ground

Temperature: 75°F

Humidity: 60%

Propeller: 11x7 Master

Mean rpm: 15,500—achieved in the various muffler modes by adjusting the throttle

Sound meter: Radio Shack's 33-2050 unit—set horizontally at 38 inches from the ground and pointing toward the nearest sound (whether from propeller, muffler, or open-exhaust outlet) and at two distances: 3 feet and 9 feet

Meter settings: "A" Scale and "Slow" response

problem, and it was later to prove "terminal."

TEST ONE

Open Exhaust: fuel—5 percent nitro; 10 percent castor oil with 5 percent ML70 synthetic oil; OPS 250 glow plug.

Apart from being noisy, the OPS 80 showed again the wide-band hp available from a modern, Schnuerle-ported, racing 2-stroke. "Peakiness," where it occurs, is usually the result of specific tuned-pipe designs. Torque had a clear peak—a massive 182 ounce/inches at 12,800rpm.

TEST TWO

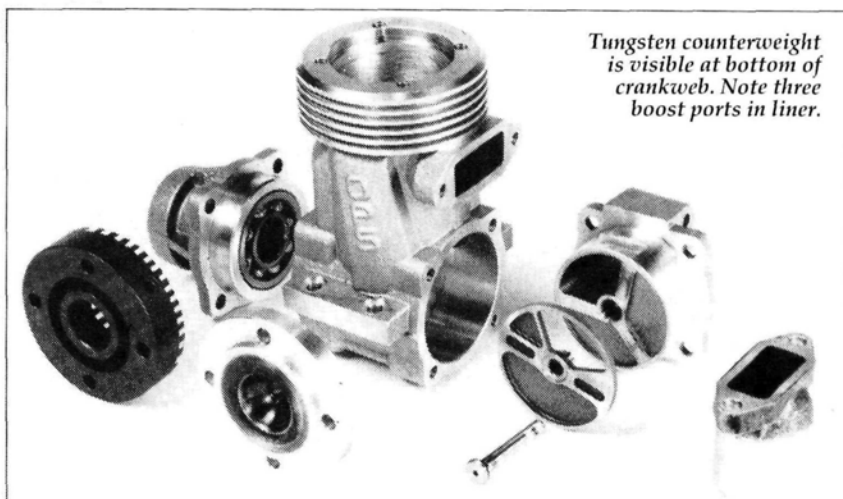
OPS Quiet Tuned Pipe: at 305mm from glow plug to first maximum diameter. Fuel and plug as in Test One.

This pipe (part no. 5920) is the unit used with the 15cc marine engine. It's much larger than the typical 60 pipe, and this 80 engine looks quite overburdened by such a large pipe. In fact, it's virtually the right volume for high-nitro use in this .80-cubic-inch engine.

Lengthwise, it's a different story: to date, my figures haven't yet agreed with the OPS figures for pipe lengths versus rpm points. For this pipe, the OPS figure is 320mm from plug to maximum diameter, to give peak points from 21,000 to 22,500rpm. On my dynamometer, previous experience has shown that to be too long, so a preliminary position at 305mm was chosen in an attempt to force an rpm peak near to the fan's hoped-for operating speeds (around 24,000rpm). Still, this fell short; as the graph shows, the peak was about 19,000 to 20,000rpm. It seems clear that tuned-pipe lengths of 270 to 285mm would be required.

This manufacturer prefers to advocate an over-long pipe, probably to enhance reliability and durability, while knowing that the real, high-rpm peaks are there for those who are willing to sacrifice some reliability and are prepared to accept more critical performance.

The explanation that differing test conditions cause the



Tungsten counterweight is visible at bottom of crankweb. Note three boost ports in liner.



OPS castings have a high-quality finish and rugged appearance. Crankcase bore is honed to receive liner and ensures good heat transfer.



Secondary needle (for mid-range and idle) and brass slide throttle are on left; main fuel-control needle is on right.

anomaly seems unlikely, as this finding has encompassed a wide variety of weather conditions; in fact, the conditions for the OPS 80 on this dynamometer might be the norm for Italian test facilities.

My intention was to explore further the shortening of the pipe and/or the use of high-nitro fuel and the associated head button. Before that, I wanted to raise the 500-pound dynamometer and associated paraphernalia on casters, so that I could take sound readings outdoors and establish some sort of standard that could be applied to future engine tests.

(Continued on page 88)

SMALL STEPS

PUTTIN' ON THE RITZ—ELECTRICALLY!!

by JOE WAGNER

THERE'S no doubt: for powering small R/C airplanes, electric motors will soon be as popular as gas engines. Although they used to be rather limited in output, electric motors are now truly potent power sources, and manufacturers continue to improve them. New types of small, rechargeable batteries—lighter and more rugged



Tony Naccarato (Burbank, CA) readying his scale Ritz ultralight for another flight. It's a big airplane with a very small motor, but it flies beautifully.

than Ni-Cds, yet with higher energy output—are now in

an advanced stage of development, and they could be on the hobby market within the next few years.

Today's electric technology is already very impressive. Some motors, e.g., Astro Flight's* Cobalt types, deliver amazing power output. Premium-grade Ni-Cd battery packs, marketed by SR Batteries*, possess the highest electric-energy capacity and the longest life of any rechargeable power supply presently available. These high-tech items are expensive, of course, because they represent today's "state of the art" for electric-powered R/C airplane models.

For years, we "Small Steppers" have been enjoying "low-tech" R/C flying with inexpensive glow engines for power, and now we can do the same with electric motors! Two particularly suitable ones are Peck-Polymers'* Silver Streak and HiLine's* Elf-50. Both are .035-size (50-watt) motors, and they sell for less than \$20. They run on packs of four, five, or six

Ni-Cds. (Sanyo's* N-800AR cells weigh 1.1 ounces each, and will provide 5 minutes or more of full-power running for either the Elf or the Silver Streak.)

For small-size electric R/C models, the best radio system I've seen yet is Futaba's* special MCR-4A—a version of its Attack 4. Its receiver has a built-in, fully proportional motor speed control, and the airborne package is powered by the same batteries that drive the motor; this minimizes the weight the airplane has to lift.

Here's the way the numbers add up for a Silver Streak-powered R/C model I designed recently: motor and propeller, 3 ounces; battery pack (five 800mAh cells), 6 ounces; radio system, 3 ounces. This means the total "hardware" weight is just 12 ounces! A glow-engine system with comparable power couldn't weigh much less than that, even using Bill Cannon's lightest "Super Micro" radio equipment!

For the kind of informal,

(Continued on page 58)

ELECTRIC BREAK-IN

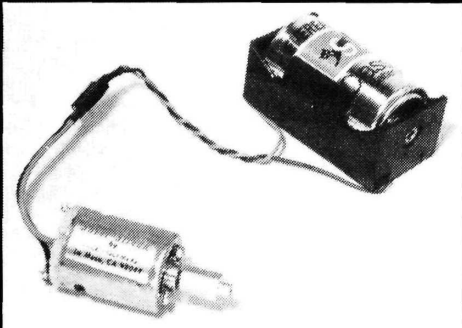
ELECTRIC motors made by Astro Flight are ready to put in an airplane and go at full power as soon as you take them out of the box. Economy-type motors, e.g., the Silver Streak and the Elf, need a little help to develop their full potential.

They need "running-in."

This simply involves hooking up the motor to a single D-size flashlight cell and letting it run, bare-shaft, until the battery goes dead. This will take several hours; the idea is to permit the carbon brushes to mate with the commutator under a light load and with minimum current flow.

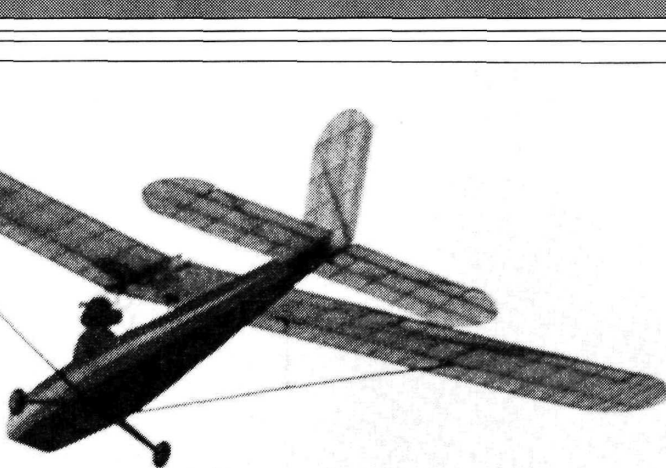
A brand-new Silver Streak may not even self-start because of imperfect contact between its brushes and commutator. To get the motor going, you might have to spin the shaft by hand. After running-in, however, the brushes will fit the commutator's curvature precisely, and they'll provide low-resistance paths between the battery and the armature windings, switched from one magnetic pole to the next at the optimum timing for maximum power.

If you neglect the run-in process and you put a propeller on your brand-new Silver Streak to fly it right away, it will probably never reach its full potential. Hot spots on the brushes caused by high local current flow will overheat and oxidize the copper commutator segments, and this can cause excessive electrical resistance. If this happens, it's almost impossible to correct, so don't neglect this simple chore!



The only "equipment" needed for running-in Peck's Silver Streak motor is shown here: a 1-cell battery box (from Radio Shack); a Deans connector (from Ace R/C) and a D-size flashlight battery.

The Ritz airborne. A 4-channel Cannon system provides control, and an old Astro Flight ferrite .020 with five 450mAh Ni-Cds furnishes the power.



strictly-for-fun R/C flying we "Small Steppers" enjoy, electric power is ideal. The ease of starting and lack of noise go without saying; but the level of performance that's possible is something else again. While in Los Angeles last summer, I was treated to an amazing demonstration of electric R/C flight by two of America's greatest proponents of this branch of airplane modeling: Tony Naccarato and Bill Young.

Tony's aircraft was big—a 6-foot-span scale model of the Ritz Model A ultralight—yet it weighed a mere 16 ounces! That light weight allowed scale-type performance with only an old ferrite-type Astro Flight .020 motor for power! I would have thought that the obsolescent little motor (which Astro Flight quit making long ago) too puny even for hand-launched R/C flying, but Tony surprised me by taking his big Ritz off the ground effortlessly. Later, he performed several touch-and-gos with the battery power half gone.

A big, light, slow, electric model seems ideal for "schoolyard" R/C flying. Tony Naccarato showed me just how tiny a schoolyard would do for his scale ultralight: he performed one entire flight within an area the size of a tennis court!

Most of the time, the airplane was practically within arm's reach. Tony has flown this model indoors many times in convention centers and other good-size auditoriums.

The models Bill Young flew for me took a different approach to electric R/C: the high-performance route. For example, Bill had a Quickie 500 powered by an Astro Cobalt 25 on 18 sub-C (1200mAh) Ni-Cds, turning a 9x6 Rev-Up prop. With all those batteries aboard, the Quickie wasn't exactly light; it weighed 5½ pounds, yet it per-

formed impressive maneuvers and showed no unpleasant tendencies after the power ran out.

Bill Young tells me that he doesn't employ any of the sophisticated charging or "battery management" techniques I've recently read so much about in model magazines. He never "balances" his Ni-Cd packs, and he merely uses a simple temperature-sensing cutoff arrangement for charging. Bill told me he knows several electric fliers who follow all the "rules," use digital multimeters and the like for "voltage peak detection," and

so on—but they don't seem to enjoy better performance, or suffer fewer problems than he does. As with many other things in life, the simplest way is often the best!

The only apparent disadvantage I can see with electric-powered R/C is the concentrated weight of the battery pack. Several ounces of mass all in one chunk can cause major stresses during "unintentional landings"! Wrapping the battery pack in foam is a no-no, because in use, the Ni-Cds develop a lot of heat, which must be dissipated easily. In the model design for the Silver Streak motor I mentioned earlier, I'll be trying a new type of battery arrangement, which I hope will overcome both the heat buildup and the "crash damage potential" problems. After I've had a chance to try the thing out, I'll tell you all about it!

**Here are the addresses of the companies mentioned in this article:*

Astro Flight Inc., 1311 Beach Ave., Marina del Rey, CA 90292.

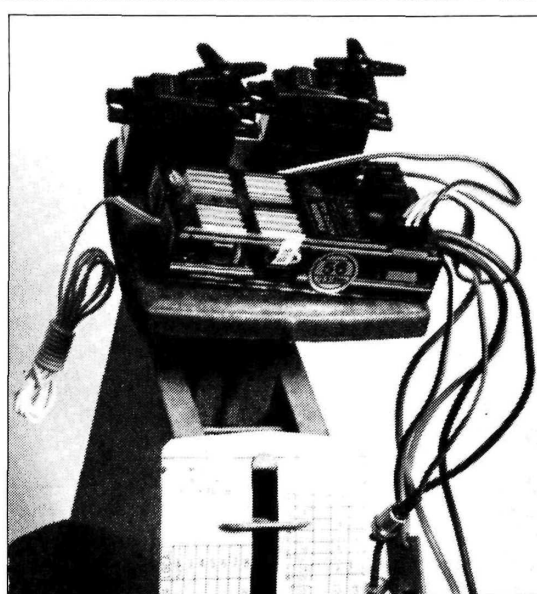
SR Batteries, Inc., P.O. Box 287, Bellport, NY 11713.

Peck-Polymers, P.O. Box 2498, La Mesa, CA 92041.

HiLine Ltd., P.O. Box 1283, Bethesda, MD 20827.

Sanyo Electric, Battery Division, 200 Riser Rd., Little Ferry, NJ 07643.

Futaba Corp. of America, 4 Studebaker, Irvine, CA 92718. ■

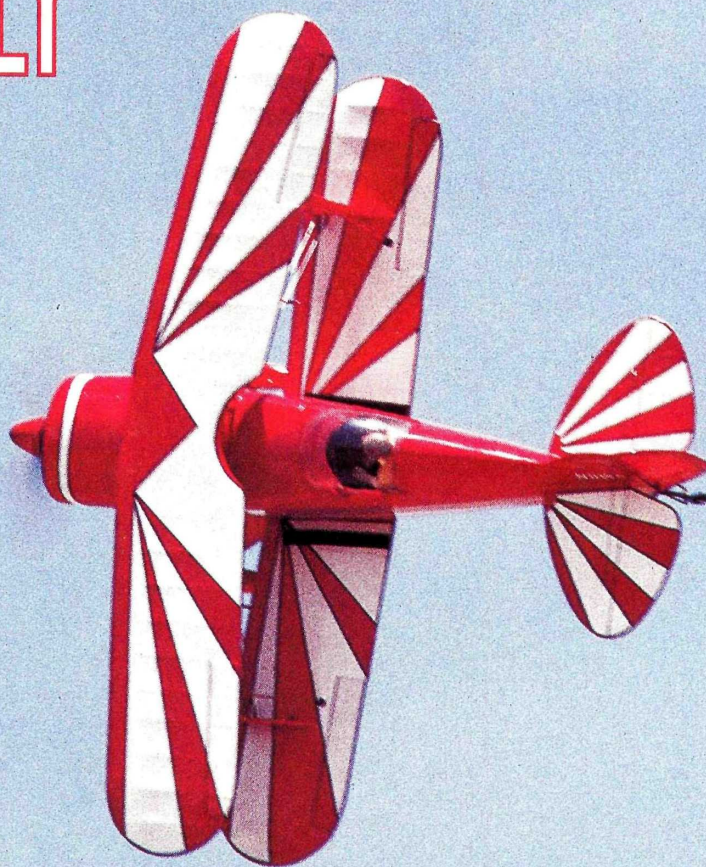


Flight pack for the electric-powered version of Futaba's Attack 4. Notice the cooling vents for the built-in speed control. This receiver shouldn't be wrapped in foam!

RIVERSIDE 4-stroke RALLY

Overhead
valves are
alive and
well in
Southern
California

by JOHN LUPPERGER



Top: Donnie McIntyre's $\frac{1}{3}$ -scale Sopwith Pup was built from a Balsa USA kit. Big model weighed in at 27 pounds and was powered by an O.S. radial. Looked and sounded just like the real thing! Center: Danny Gayhart's big Pitts had plenty of power to do a knife-edge flyby with its O.S. 300 Twin. Model weighed 17 pounds and was controlled by a Futaba 8-channel PCM. Above: Jerry Kitchen put on quite an aerobatic show with his O.S. 1.20-powered CAP 21 entry. Extremely agile at 13.5 pounds. Jerry did difficult aerobatics and scored very high. Right: The J-3 Cub is one of the most popular subjects for 4-stroke engines. Chris Reed's $\frac{1}{4}$ -scaler was built from the Pilot kit. At 16.5 pounds, model was amply powered by a Saito 270. As it comes in slowly for a tail-up landing, it's hard to tell from the real thing!

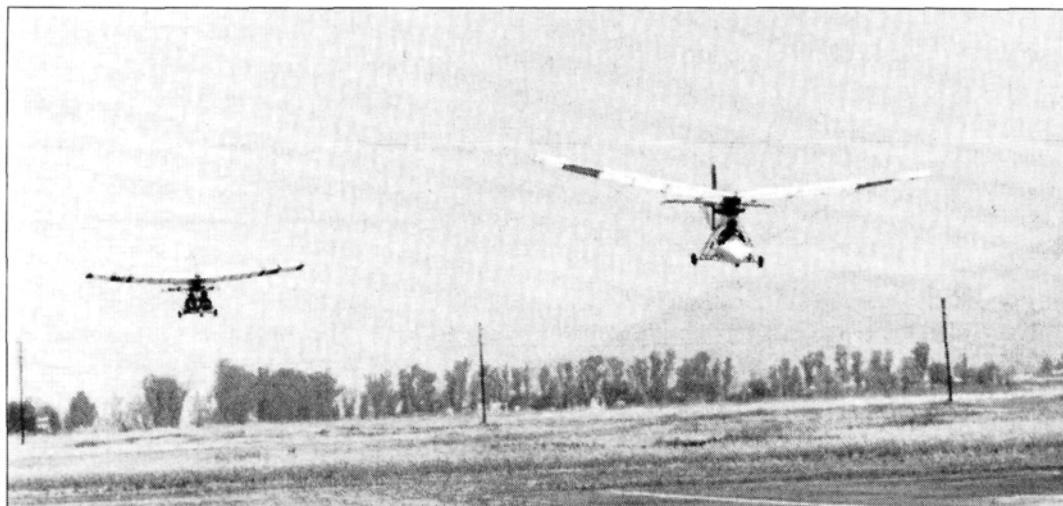
RIVERSIDE 4-stroke RALLY

FOR SOME UNKNOWN reason, certain events become something more than "just another contest." They become an important date on your R/C calendar,

skilled emulation of the full-scale aircraft after which their planes are modeled. Some come just for the fun of it, some to wet their feet in the scale arena. They know that they



Members of the R/C Aero Flight Team starting up their Nuttin Special models. All the planes were powered with O.S. Surpass 1.20s. Well-organized support crew were essential to putting on flight demos.



The ultralights put on a great flight demo. These cloth-and-wire flying machines seem to be nothing more than big models. The crowd really enjoyed their close-in, slow-and-low flybys.

a "first" for new enthusiasts and, most important, a time for people to renew old acquaintances and to make new friends.

The 8th Annual 4-Stroke Contest is just such an event. Even though it's a full-blown scale contest (as opposed to today's popular "uncontests"), it remains an enjoyable, low-key event that's enjoyed by all types of modeler.

There are those who come with only one objective: to excel. We all get to enjoy and admire their efforts—not only the beauty of their miniature masterpieces, but also their

can compete, but still have a good time. For many contestants, it's their first scale competition, and it's an initiation that they'll remember fondly as they pursue the hobby.

The 8th Annual 4-Stroke Contest took place at the Riverside R/C Club's flying field in Perris, CA. The flying site is outside town in an open area that's used for hay farming. It's a perfect place for a flying field, and the Riverside Club has

done a great job setting it up. The paved runway is excellent, and it faces the

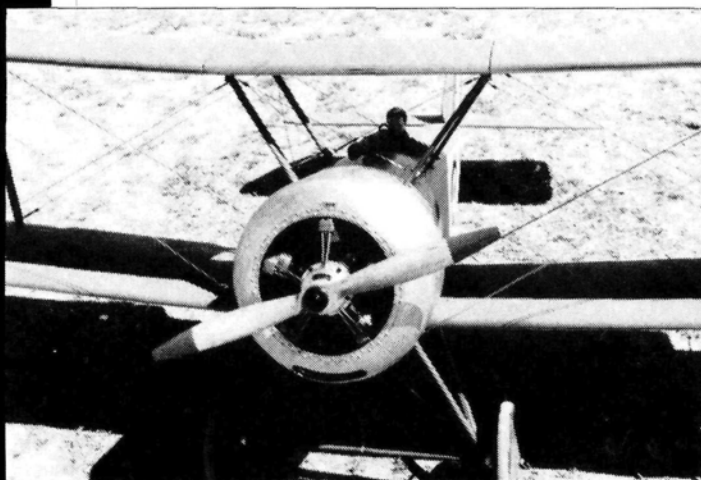


Jim Morrow and his 1/4-scale Pilot Tiger Moth just seem to get better. At 16.5 pounds, the Saito 1.20-powered model is very realistic in its unusual Swedish livery.

prevailing wind. For the contest, members set up a large circus tent to provide the spectators with some

RIVERSIDE 4-STROKE RALLY

O.S. radial is almost swallowed up by Donnie McIntyre's 1/3-scale Sopwith Pup. Big model flew on the wing and had just enough power to be convincingly realistic.



A Warbird of a different style was the Circus kit Cessna L-19 Bird Dog entered by Doug Crumley. Model weighed 13 pounds and was powered by an O.S. 1.20 Gemini. When Doug lowered the flaps for a slow flyby, the model seemed almost to hover!

Well-known scale modeler Garland Hamilton was the big winner with his 1/6-scale scratch-built Fairchild PT-19. Model is exact scale built from factory drawings. Even with all that great detail, the PT-19 weighed only 9 pounds and was powered by an Enya .61.



craft types—everything from Golden Age to modern aerobatic planes. Engine sizes ranged from .40

through 3 cubic inches.

Aside from the wonderful scale aircraft, a flight demo team and some ultralight pilots provided extra flying entertainment. The R/C Aero Flight Team put on an excellent show

Adams and lead pilot Doug Wilbur flew a routine to music, and their formation-flying was highlighted with smoke.

There's an ultralight operation with a wide variety of models next to the club site, and they did their thing next. The ultralight pilots demonstrated slow flight, fast flight and touch-and-gos on the model runway—exciting stuff! I think an ultralight would make a great candi-

FINAL STANDINGS

1st	Garland Hamilton	Fairchild PT-19
2nd	Jerry Kitchen	CAP 21
3rd	Jim Morrow	D.H. Tiger Moth
4th	Donnie McIntyre	Sopwith Pup
5th	Danny Gayhart	Pitts S2

date for a 4-stroke model!

The contest, as always, was well-run by the Riverside R/C Club, under the guidance of CD Don Lien. This was the eighth—and last—time that Don will run the event; next year, his new business will occupy all his time. The judging, impounding and scoring were handled by a host of people who are all to be praised for a job well done. Many thanks go to Hobby Shack for its sponsorship and for acquiring trophies and prizes from many manufacturers. As always, there were several thousand dollars' worth of prizes, and the contestants collected many goodies.

If you like 4-strokers, watch out for 1990's date and show up as either a contestant or a spectator. See you there! ■

with their O.S. 1.20 Surpass-powered Nuttin Special models. Bo Lyman, Tom Easterday, Cliff

SIG MANUFACTURING

4 STAR 40

Fills the niche for a sturdy, simple and versatile sport flier



by RON FARKAS

SPECIFICATIONS

Type: Sport and fun-fly model

Wingspan: 59³/₄ inches

Wing Area: 604 square inches

Weight: 5 pounds, 1 ounce

Wing Loading: 19.3 ounces per square foot

Power Req'd: 40 to .50

No. of Channels Req'd: 4

Suggested Retail Price: \$69.95

Features: Balsa and lite-ply construction; interlocking fuselage parts with stringer turtle deck; simple wing construction without leading-edge sheet or capstrips.

Comments: High-quality die-cut parts with excellent fit. Very easy to build; light wing loading; excellent sport-flying characteristics that are suited to a wide variety of modelers.

BEAUTY IS IN the eye of the beholder, and the new Sig* 4 Star 40 is certainly a beautiful model airplane as far as I'm concerned. Although, at first glance, it looks a little plain, its simple construction and good flying qualities should make it a popular addition to existing .40-size sport models. There's certainly no shortage of kits in this class, so in designing yet another, Sig has concentrated on features that will appeal to most sport modelers.

A 4-STAR FEATURE!

Simplicity was high on Sig's list of priorities. The 4 Star 40 just may be the easiest model of its type to build. The use of interlocking light plywood (the original Sig lite-ply) fuselage parts, sheet tail surfaces, and minimal wing sheeting all contribute to ease of assembly without sacrificing strength. The resulting airframe has rather angular lines, but the slightly curved fuselage top, aft stringers and bubble canopy help it to avoid that boxy look, and tapered ailerons give the illusion of a tapered wing planform.

The thick airfoil, ample wing area and generous nose and tail moments give the 4 Star 40 a broad performance range, from very gentle all the way to fully aerobatic.

You can tailor this airplane to your flying style by varying the size of engine, the control throws and the CG location. In its most docile trim, it could easily serve as the first low-wing model for a pilot with some aileron experience. With power and trim dialed-up to the maximum, the model behaves like a thoroughbred fun-fly air-



plane—capable of respectable pattern maneuvers and all sorts of hot-dog flying. Even set up this way, it's always predictable and well-behaved.



BMW PHOTOS BY RON FARKAS/CHRONES BY RICH URAVITCH



Extremely wide track of the aluminum gear sure reduces risk of scuffing wing tips. O.S. 48 Surpass 4-stroke is a good choice for all-around performance.

A STAR IS BORN?

The box contains a formed canopy protected by tissue paper, dural landing gear, bagged hardware items, pre-cut tail surfaces, bundled balsa strip stock and shear webs, decals, folded plans and an illustrated instruction booklet all on top of sheets of die-cut parts.

The 1/8-inch lite-ply sheets contain fuselage sides, doublers and formers, and the wing ribs are of 3/32-inch balsa. This kit goes together very quickly but, to get off to the right start, you should be patient when removing the parts from their sheets. In my kit, the dies hadn't completely cut the lite-ply and many cuts had to be gone over with a modeling knife. The balsa ribs came out cleanly.

Throughout construction, I used Carl Goldberg Models* Jet, Super Jet and Slow Jet CA. I used Jet for tacking balsa, Super Jet for the lite-ply joints and Slow Jet for laminations and glue fillets. I also used Jet Set accelerator to help kick off the fillets.

Apart from a straight section from the lower main spar to the trailing edge, the airfoil is symmetrical. The wing can therefore be built on a flat surface, and you

begin by positioning the spruce lower main spar, the balsa rear spar and the trailing-edge sheet. For this, use the plan and a few ribs as guides.

Glue all the ribs into position, followed by installation of the vertical-grain shear webs. These webs are intentionally cut about 1/16 inch wider than necessary to allow for custom-fitting between the ribs. I took a little short cut: I first trimmed the webs, and then I alternately glued a rib, a web, a rib, and so forth. This saved time and also ensured that the ribs were exactly vertical.

Next came the strip trailing-edge stock and the top sheet, the top spars and the leading-edge stock and, finally, the center-section sheeting. About an hour after I had started, the left panel came off the building board. Next, I installed the forward bot-

"FLAPERONS....

USEFUL OR A NOVELTY?"

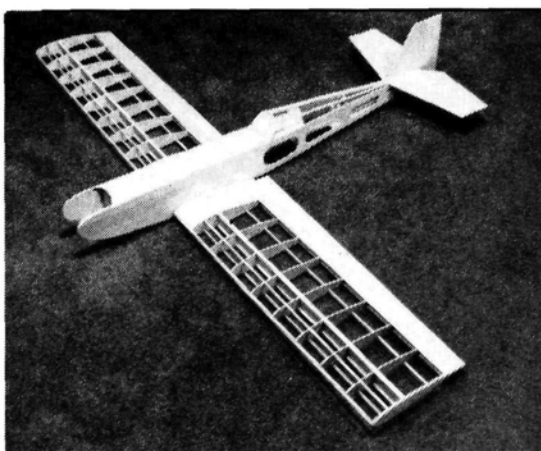
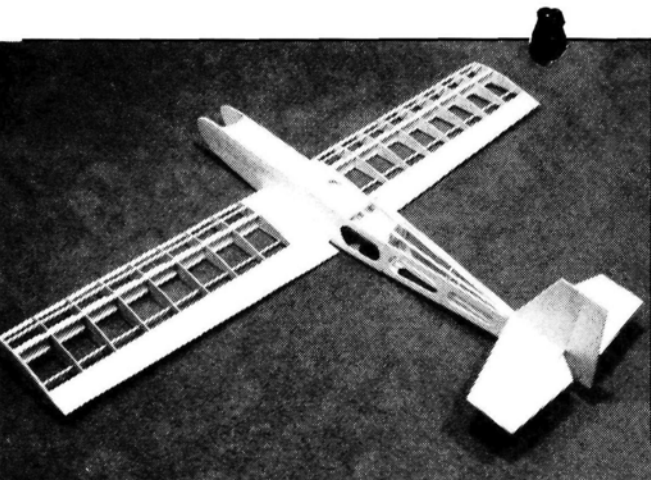
THE FUTABA 7UAF programmable radio has many electronic mixing features, of which the flaperon mode and elevator-flap (channel 2-6) mode are of interest to us. Using these special functions requires that each aileron be operated by a separate servo: one is plugged into receiver output no. 2, and the other into no. 6.

Flaperon mixing allows both ailerons to be dropped together to act as flaps, although they still work in opposition as ailerons. Before electronic mixing came along, this was accomplished through mechanical pushrod linkages or sliding servo trays. The elevator-flap mixing option couples the two functions so that the flaps (ailerons) drop a little, along with the application of up-elevator, and vice versa—like the stunt flaps on control-line airplanes.

One of the Futaba system's most attractive features is that the selection of such options and the adjustment of



throws is done by pushing buttons while watching the digital display. When you have the throws you want, you can note the displayed settings for future reference. This is particularly valuable when you're varying the mixing ratios while test-flying.



Uncovered airframe shows the simplicity of the design (3/4 view).

tom spar, the lite-ply wing tip and most of the bottom center sheeting.

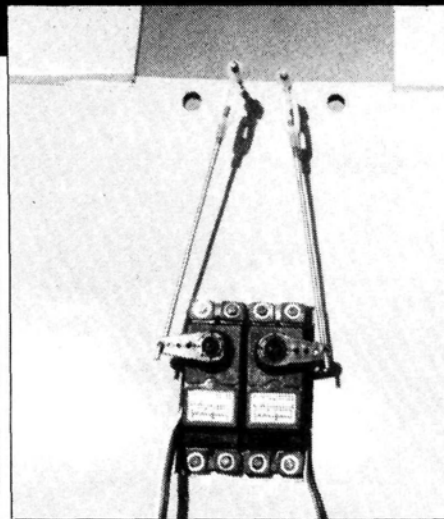
About one third of the right wing is drawn elsewhere on the plan but, rather than cut up my plan, I traced the section onto drafting paper and pinned it to the board in the proper position. Then I built the second wing panel in the same way. Assembly goes quickly because of the plane's simple design (no leading-edge sheeting or capstrips), the excellent parts fit and the use of instant glue.

I joined the wing panels with the center-section brace in position, and I eased aileron installation by having pre-grooved torque-rod blocks. The rods are already bent to the proper angle for differential aileron travel.

The fuselage was next, and my first steps were to laminate the two fire-wall pieces and install the engine and aluminum T-mounts. Next, I laminated the doublers to the inner face of each fuselage side. Then, as is typical with this sort of construction,

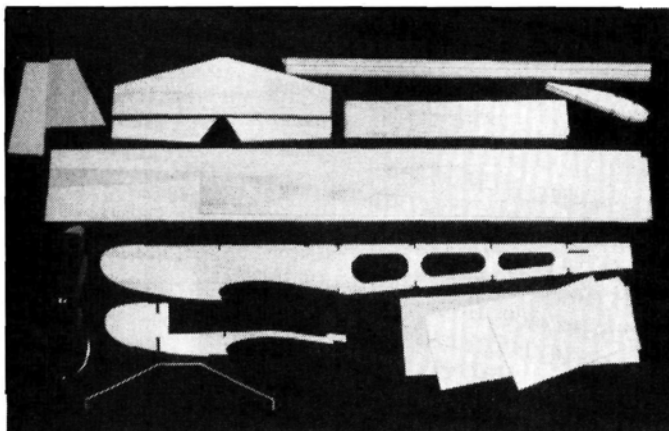
the sides, formers, cockpit floor and bottom sheet were all joined and temporarily held with rubber bands. Because lite-ply has a natural tendency to curl, it's essential to establish alignment of the fuselage center line and to eliminate longitudinal twist. The instructions wisely advise builders to tack-glue a few sections at a time while verifying alignment, and then later reinforce all the joints. The resulting fuselage "box" is very strong and torsionally rigid. I next added the balsa top sheeting and the stringers.

The instructions recommend that you install the landing-gear plate and the forward fuselage bottom next, and then mount the wing, but I decided to mount the wing first, while the hole for the leading-edge dowel could be drilled right through former F-2. In fact, I cut the hole in the wing with a length of sharpened 1/4-inch brass tube. I also strengthened the area around the hole in F-2 with scrap ply.

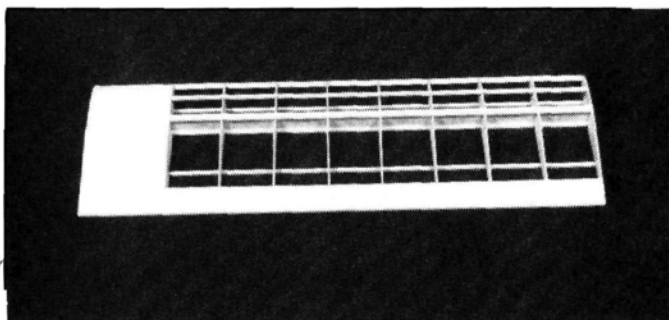


So far, the results with the 4 Star 40 have been inconclusive, i.e., neither the flaperons nor the stunt flaps have produced marked improvements in flight characteristics on this airplane. Perhaps it needs more flap

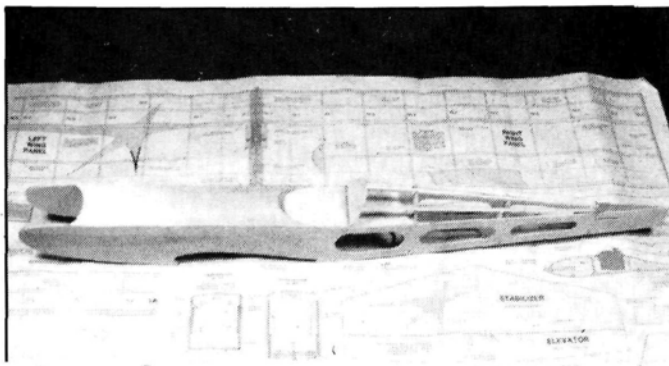
travel, which can be accomplished by using longer servo arms or by shortening the aileron horns. Anyway, I've enjoyed experimenting, and the Futaba programmable radio has made it very easy.



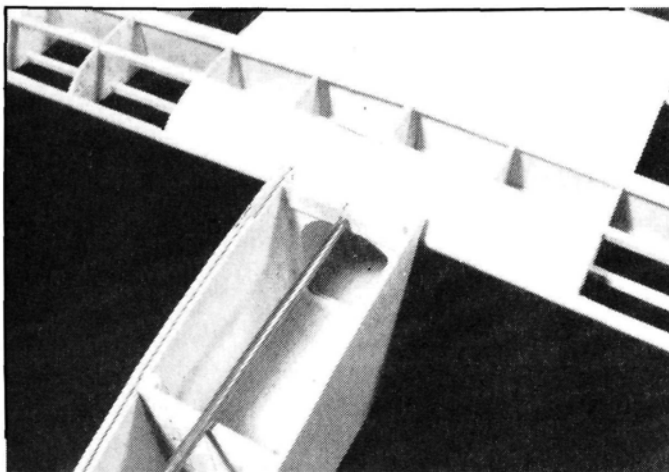
Basic kit contents include stripwood, machined-balsa tail components, die-cut balsa ribs and die-cut lite-ply fuselage parts. Aluminum gear, canopy and hardware are also included.



Simple wing construction features turbulator spars rather than leading-edge sheeting. Shear webs extend full span.



Completed fuselage shows intelligent use of lightening holes and stringered turtle deck in the aft section. Front deck is curved balsa sheet over formers.



Author made the hole for the leading-edge dowel by passing a long sharpened brass tube through the former.

Low-speed snap rolls feature a clean break with a positive recovery on heading.

After that, I installed the landing-gear plate and the bottom nose sheet. Both fit perfectly, but it took a lot of force to make the lite-ply sheet follow the curve of the fuselage while the glue was setting. This task would have been easier if the part had been die-cut with the face grain running crosswise rather than lengthwise. To ensure that a hard landing will only pop the gear off without pulling out the block, I prefer to hold the dural gear on with $\frac{1}{4} \times 20$ nylon bolts rather than machine screws. I love tail-draggers, and I just couldn't resist installing the optional Sig SH-378 wheel pants, because they really improve the model's appearance.

I installed the radio next, using the supplied plastic tube pushrods. (There's ample room in the fuselage for any components.) I chose the Futaba* 7UAF programmable 7-channel FM system with the standard S-148 servos. This fancy radio isn't really necessary for this airplane, but I wanted an excuse to operate the ailerons by separate servos, and I also wanted to satisfy my curiosity about the use of flap-erons and stunt flaps.

The model was nearly complete; the only parts left in the box were the tail surfaces, which required sanding and joining of the elevator halves with the wire provided. The next major task was covering, and the tail components were installed after that.

Hobby Lobby International* now markets an imported iron-on covering material called "Oracover," which I decided to try on the 4 Star 40. This proved to be very easy to work with. The waxed-paper backing just fell away from the dry adhesive side of the covering. The adhesive was activated at moderate temperatures, giving a strong bond. A much higher temperature was required for shrinkage, but all the wrinkles came out, and the material didn't melt when overheated. Oracover's strength was particularly noticeable over open framework, where the covering remained taut and puncture-resistant without being rubbery. Also, by following the instructions to the letter, I easily avoided any trapped air bubbles on the sheeted surfaces. Using two irons—one set on "medium" and the other on high—I worked quickly. I painted the fire wall and wheel pants with Hobbypoxy*.

I was first attracted to the 4 Star 40 by the advertisement that showed a yellow airplane with white stars and black pinstriping, and I intended to have one just like it. The kit's decal sheet only provides the fuselage trim, but patterns for the other stars are shown on the plans, so I cut them from Coverite* Presto material and sealed them in place with low

(Continued on page 81)

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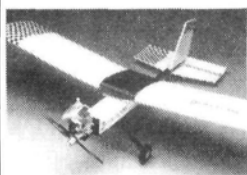
*Our store is located in North Montreal in the
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Duracraft, Inc.
1007 Orchard Grove Drive
Royal Oak, MI 48067



DuraBat
.40-size, 4-channel
aerobatic trainer.

FIFTY YEARS AGO

(Continued from page 20)

Aircraft, Inc., located outside Los Angeles, took the risk and won with its high-speed, single-seat pursuit plane—the Vanguard.

This plane, featured on the magazine's cover 50 years ago, was built for production, so it rolled off the assembly line. It came in three models, which would accommodate several arrays of armament. The prototype was 27 feet long and had a span of 36 feet, and it used Pratt & Whitney Twin Wasp engines. It landed at 73mph and its rate of climb was more than 6,000 feet per minute! "At last, an Ameri-



A model with all the options! This remarkable piece of work took two years to build.

can interceptor worthy of the name"! Vultee VP Dick Palmer gambled nearly a million dollars on the Vanguard, but soon after, an order arrived from the Swedish government for 100 48Cs! Robert McLaren called it the "vanguard of triumph"; it was certainly a success for the manufacturer, and it was designed to bring victory in the war, as well.

BACK TO THE DRAWING BOARD

An autogiro won the "Air Ways" originality contest. Arthur Bujnowski (Astoria, NY) gave it twin motors, which powered propellers that turned in opposite directions. This kept the model steady in the air, and its streamlining and boom-tail design made it efficient. Jim Wilson's (Whitefish Bay, WI) Seversky P-35 pursuit plane took two years to build and included just about everything! It had retractable landing gear, pneumatic wheels, upholstery, a scale radio set and tiny earphones, an illuminated instrument panel and a variable-pitch prop carved from wood. Even the baggage opening had a small catch on the door, which was illuminated by a tiny light bulb! All this, and it weighed less than a pound!

Things have changed, for better (it's no longer wartime) or worse (airplanes don't seem as safe anymore, and prices sure aren't the same). The 29-cent model advertised in the May 1940 issue of *MAN* wasn't radio-controlled, and it was pow-

(Continued on page 78)

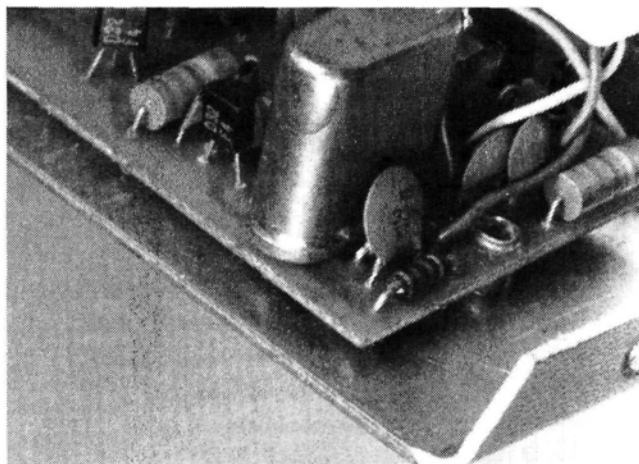
BASICS OF

OF RADIO CONTROL

by RANDY RANDOLPH

Crystals... ...and you thought YOU were controlling your airplane!

EVERY R/C system has at least two crystals that control the frequency of transmission and reception. Dual-conversion receivers have an extra one that brings the total number of crystals to three. Not only do crystals keep transmitters on frequencies that are prescribed by law, but they also keep receivers "listening" to the correct transmitter. They're usually the most expensive electronic part in our radio systems—and the most vul-



The transmitter crystal (right, center) is on the board that generates the radio-frequency signal. This board is usually mounted near the antenna.

nerable to damage.

At this time, crystals are the best, reasonably priced frequency-controlling devices. A number of naturally occurring crystalline substances transform mechanical stresses and strains into electrical energy. This abil-

ity is called the "piezoelectric effect." When these crystals are squeezed between two electrodes, they produce a voltage across those electrodes. This also works in reverse: when an electric voltage is applied to them through the same elec-

trodes, they become stressed by that voltage.

Crystals are used in microphones, stereo pickups, speakers and numerous other devices that transform vibration into voltage, or a changing voltage into vibrations. The size, shape and type of crystal control the frequency at which it vibrates.

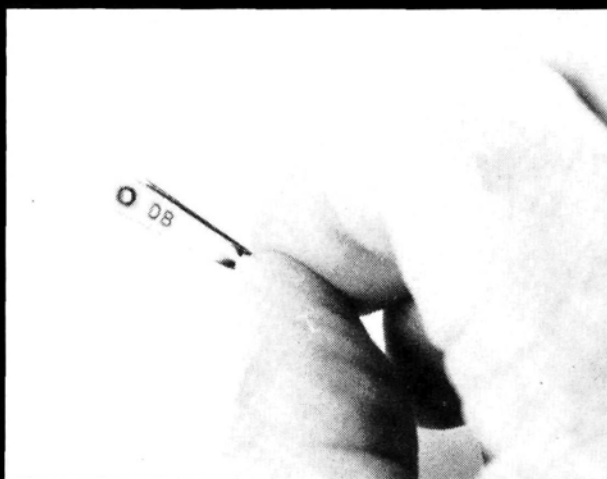
For frequency-controlling devices in radios, quartz crystals are precisely cut from the natural crystal and ground to an exact size that gives it natural resonant frequency, which is the only one at which it will vibrate when a voltage is applied.

Crystals that are ground to have natural resonant frequencies in the range of our

CLEVISES—CAVEAT EMPTOR!

A while ago, I wrote about the desirability of using rolled threads with the clevises on the market. It has since come to my attention that certain clevises of questionable quality closely resemble those produced by an old and respected American company. Clevises that are stamped with the initials "DB," as in the accompanying photograph, should be added to those listed as satisfactory in my earlier article.

The "buyer beware" rule must be applied to the hobby business as well as to all others in our "bottom-line" economy. The only real answer to materials of poor quality is to notify the manufacturer and to refrain from buying a product from that company again. That's basic!



The initials "DB" identify satisfactory clevises. Black look-alikes don't have this identifying mark.

R/C equipment are very small and very thin in cross-section. They're mounted between small electrodes and are protected by a metal housing. The electrodes act as the only shock absorbers for the crystal within its case. Under normal conditions, this protection is adequate, but unusual shock or severe undamped engine vibration could cause damage. For this reason, the receivers in our airplanes should be wrapped in vibration-absorbing foam. Remember: if a crystal fails, the receiver fails!

The crystal in a transmitter isn't usually subjected to engine vibration, so this

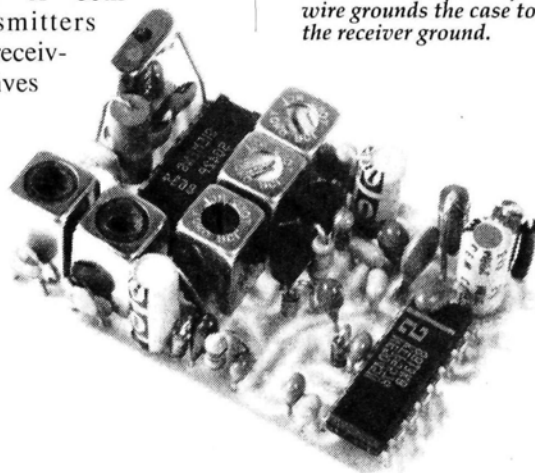
isn't a problem; however, it isn't immune to rough, careless treatment. Most damage to transmitters occurs during the trips to and from the field, rather than during flying sessions.

Systems that make use of changeable crystal modules are subject to damage when the additional modules are carried carelessly in flight boxes. These systems are no longer popular: the broad nature of the tuning systems needed to cover all frequencies that might be used made the receivers very sensitive to overload and adjacent-channel interference. Also, flying sessions were often

ruined because the modeler had forgotten to change the receiver frequency when the transmitter was changed. Intelligent treatment of both transmitters and receivers gives

long and satisfactory service from radio equipment. ■

The crystal is on the top corner of this receiver board. A short piece of wire grounds the case to the receiver ground.



THE FOX EAGLES HAVE ARRIVED!

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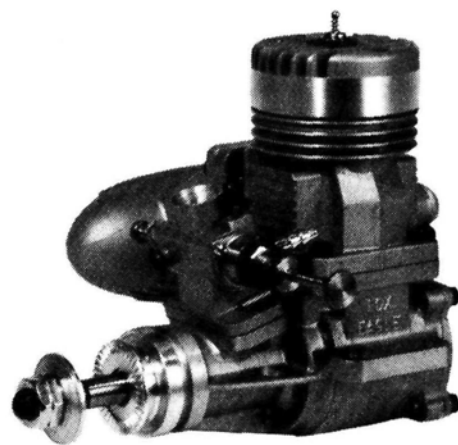
Fox Eagle 4:

The Fox Eagle 4 is the latest modification of the motor that Model Airplane News' "Great Shootout" gave the highest points for power, idle, and overall performance and value. The series 4 features a new, sturdier crankcase casting, a larger diameter crankshaft, and a host of other refinements. We believe that no other 60 size motor on the market will pull a good size propeller as fast.

Compared to other 60 size motors on the market, the Fox Eagle 4 has the largest crankpin, the most massive connecting rod, and is generally of the most rugged construction. The Eagle is also available in a larger bore version, which gives a displacement of .74. This extra displacement makes it possible to pull a little more propeller.

The MK X design carburetor has been further refined to give a very smooth throttling action all the way from low idle up to full power. The bolt on cylinder design gives the unique advantage that the cylinder can be turned so that the exhaust faces left, right, or to the rear. This can be accomplished merely by pulling the 4 cylinder hold down screws, turning the cylinder assembly to the desired position and re-installing the 4 screws.

Fox Eagle 4's are supplied with a conventional tilt down muffler. If a tilt up muffler suits your airplane better, you can exchange your tilt down merely by sending it to us and asking for an exchange. There is no charge for this. While we do not manufacture pipes, the Eagle 4 responds well to a conventional pipe installation. The screw spacing on our exhaust flange is similar to the Rossi screw spacing, and the hardware designed for either the Eagle III, Eagle 4, or Rossi will fit readily. When the absolute maximum power is desired, we recommend the use of our F size carburetor, which has an intake diameter of .350, in conjunction with one of the after market pumps on the market. The rear cover is fitted with a tapped hole to accept a pressure fitting if you have occasion to use case pressure for either pump operation, smoke operation, or some other case pressure use. The hole for the pressure tap is not drilled all the way through. To make the pressure tap functional, you merely remove the rear cover, drill the hole all the way through with a 1/16" drill, and then install and fit your pressure tap. The thread is a 4-40.



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FIFTY YEARS AGO

(Continued from page 74)

ered by a rubber band, but try to find an engine for \$15 today! Fortunately, some things stay the same—modelers and engineers are still as creative and dedicated as ever! ■

GIANT STEPS

(Continued from page 30)

but I consider it as important as fore-and-aft balance. This is a little more difficult to check, and I haven't yet made a jig for lateral balance. I pick up the model by its prop and under the rudder. (Considering the size of some of the planes I've built, this is no mean feat!) If either wing tends to drop, I add lead weights to the lighter wing until either wing drops indiscriminately. That's usually enough to get close to a balance.

So far so good—but we haven't finished yet! Although balancing the model statically is a great place to start, it's often not enough to ensure that it will fly well. I'm sure you've noticed on most plan sheets that the wing and tail surfaces are mounted to the fuselage at specific

angles of incidence. (This isn't always the case, but such notes are shown where they matter.) Assuming you built the model accurately, those angles should have persisted, right? Not necessarily. It isn't a bad idea to check them after construction has been completed. Robart* makes an excellent incidence meter for this purpose, but if this meter is too small for your planes, you can make your own. (I explained how I made mine some time ago, in this column.)

Just because the plan recommended a specific angle of incidence doesn't mean that that number is carved in stone. If your model doesn't fly the way you think it should, it's easy to shim or trim under the wing saddle; this may make it fly better. Make any changes in small increments and test-fly the model after making a change. It's important that you change only one thing at a time; otherwise, you won't know which correction made the difference!

To make changes easily, I rarely glue tail surfaces into place—especially the stab and elevator. If they're screwed or bolted into place, I can alter the angles slightly if I decide the model needs such changes.

You should also check that the wings aren't warped; this will certainly interfere with the way your model flies. (Eliminating such warps is an entirely different subject, and one that I'll cover another time.)

If your model doesn't fly the way you think it should (or the way the advertisements said it would), look up the pattern fliers in your club or area. These people really know how to trim models for flight, and they know what to look for. In every club, there are always one or two pattern fliers who are considered experts at trimming. With their help, you can often turn a real "dog" of an airplane into a "pussycat"!

So don't give up on a model that doesn't fly to your satisfaction: its bad habits *can* often be corrected! Good flying—safely—to you all!

**Here are the addresses of the manufacturers mentioned in this article:*

ViP Publishers, Inc., P.O. Box 16103, Colorado Springs, CO 80935.

Robart Manufacturing, P.O. Box 1247, St. Charles, IL 60147. ■

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SINUS

(Continued from page 36)

with a thermal and started to climb. The F3E puts more emphasis on climb-out and gliding speed, and I didn't expect much in the way of thermal performance with such a high wing loading—16.4 to 17.6 ounces per square foot. (One thing to watch out for at this high loading is tip stalls. Don't try to fly this model too slowly when thermalling.)

When it was time to land, I was sure it would be very difficult to put this fast model down where I wanted, but as it came over the edge of the field, I raised the spoilers: the Sinus made a steady descent at a reduced airspeed and landed a few feet in front of me. I was pleased, to say the least!

The next time I flew the Sinus was at the F3E contest. In Europe, this event is flown with 10 cells, which is actually what the Sinus was designed for. At 55 ounces, my Sinus was as much as 21 ounces heavier than some of the other models entered. This excess weight really hurts in the climb-out: I was running the motor about 40 seconds (out of a total of three minutes to do laps) before entering the course.

On my second climb-out, I ran the motor about 20 to 30 seconds for a shot at additional laps before the time ran out. This left me with only a 30-second motor run for the 5-minute thermal duration part of the event. I was able to make the full duration a couple of times, but if lift was scarce, or I ran into sink, it just wasn't enough. I didn't do very well in the contest, but I really had fun flying the Sinus.

I had built two models, and because my good flying buddy Dieter Lamprecht was such a help in getting them together, I lent him the second one (my backup ship) for the contest. As it turned out, he placed higher than I did!

Since the contest, I've done a lot of flying and learned a lot about handling the Sinus. The most important thing is to keep it moving on step. It thermals better this way, and it won't tip-stall when circling in lift.

I also picked up the Ultra 800 motor and Freudenthaler 9.5x5 prop that Hobby Lobby recommends for the model. With this combination, I had a little less power than with the FAI 05 and KW 8x6, but my motor run time went up to just over two minutes. I then tried a KW 9x6; the climb performance was on par with the FAI 05, and the motor run time only dropped a few seconds (to two minutes).

I now get four climb-outs on one battery charge. I certainly could have used that extra motor run during the contest!

I've flown the Sinus in one 7-cell duration event (again, I didn't do well, but I enjoyed myself!). I out-climbed all the other models (except one), but lost out in the light lift: the high wing loading was too much against the floaters. The thermal potential of the Sinus is pretty good when lift is available, though. During one round, thermals were present for a very short time. With its high climb rate, the Sinus was able to reach an area of lift that was farther off field than the other models could reach. I made my time quite easily, while the floaters struggled. Everyone paid a lot of attention to my "rocket" whenever it flew, which, in itself, was rather exciting.

The Sinus is a high-performance electric that will open up new dimensions of flying for experienced pilots. This model's performance level and price may put it out of the range of the average pilot, but, for those who are ready, the Sinus will cause excitement whenever it's flown!

**Here are the addresses of the companies mentioned in this article:*

Hobby Lobby, 5614 Franklin Pike Circle, P.O. Box 285, Brentwood, TN 37027.

Astro Flight, 13311 Beach Ave., Marina Del Rey, CA 90292.

Airtronics, Inc., 11 Autry, Irvine, CA 92718.

Novak Electronics, Inc., 128-C E Dyer Rd., Santa Ana, CA 92707. ■

SIG 4 STAR 40

(Continued from page 72)

heat. Presto is great for trim because air bubbles can be pressed out before you apply heat. The pinstriping is Carl Goldberg Color Stripe pressure-sensitive tape.

The completed 4 Star 40 weighs 5 pounds, 1 ounce, for a 19.3-ounce-per-square-foot wing loading. I obtained a balance point within the acceptable range by placing the battery in the radio compartment above the wing rather than below the fuel tank. For power, I chose an by an O.S.* .48 Surpass 4-stroke engine, which is suitable for most requirements.

FALLING OR SHOOTING?

At a field with a paved runway, and conditions for the test-flight were ideal. The 4 Star's control throws were set according to the instructions. The landing gear's

(Continued on page 86)

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EP Challenger

by RICH URAVITCH

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Your editor launches the Challenger on its test-hop. All that was required was a slightly nose-high release. Positive climb.



NO DOUBT ABOUT it, radio fans—electrics are here, and you can bet that interest in this unique form of propulsion will continue to grow.

Until recently, much of the electric-power activity was confined to small, special-interest, localized groups of R/Cers, who were content to exchange information with other modelers who had similar interests. They weren't concerned with "converting" the glow guys to the non-methanol method of flight. It went on this way until someone discovered that, rather than being limited to the lightly loaded, stick-type floater airframes, some real performance was available, as demonstrated by the F3E category of competition. This capability, coupled with the perception that electrics could be flown in smaller fields (not necessarily true), addressed the critical noise issue squarely by offering virtually silent operation and by giving the modeler an alternative source of propulsion. This need was quickly recognized by manufacturers and suppliers who reacted by providing us with an ever-expanding range of kits and power packages.

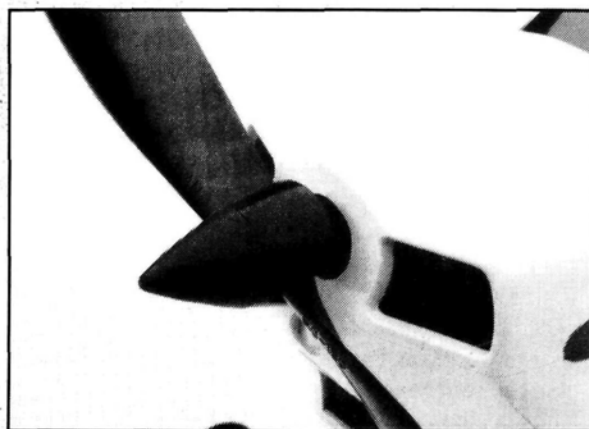
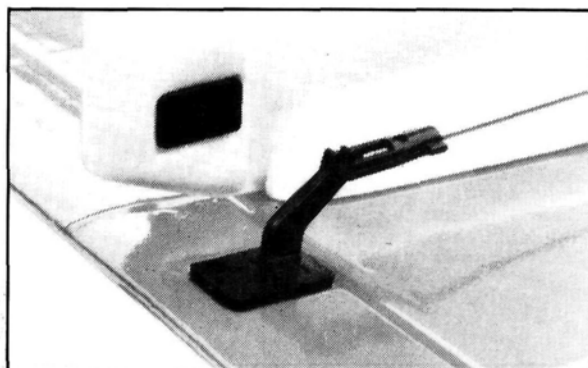
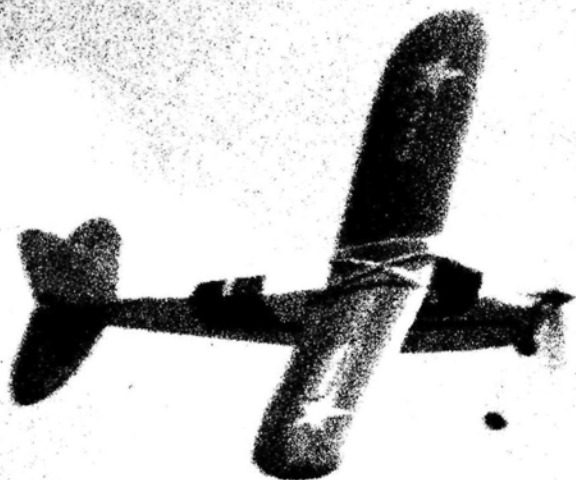
A VIABLE ALTERNATIVE

Electric airframes, like their alcohol-burning relatives, are available in a variety of forms from full kits to ARFs. Their full range of capabilities is found in basic trainers through racers and high-performance motor gliders. Most arguments for not trying electrics are quickly vanishing, and, while electric flight is never likely to overtake glow power, it can be

Right: Molded control clevises and horns are supplied in the kit—unusual, in that the clevis snaps into a receptacle rather than through the horn.

Below right: A snap-on spinner provides people protection, and it fairs the prop to the cowling.

Despite its small size, the little Challenger handled some tough winds extremely well.



**Despite its
unsophisticated
appearance,
this electric will
surprise you**

SPECIFICATIONS

Type: Electric ARF

Span: 33.9 inches

Area: 170.5 square inches

Weight: 16.8 to 18.9 ounces

Wing Loading: 14.4 ounces per square foot (at 17-ounce weight)

Power Req'd: Turbo motor with 2.6:1 gearbox (supplied)

No. of Channels Req'd: 2 (rudder and elevator)

Suggested Retail: 169.95/deluxe kit

Features: All molded-foam construction, excellent assembly and flight manuals, Auto-Cut battery eliminator circuit; 6V battery pack and quick charger.

Comments: This is a fine entry-level airplane for the R/Cer who wants to go the ARF route. It's very stable and easy to fly in a variety of conditions, and the kit provides everything necessary, but the radio. Standard-size servos may be used.

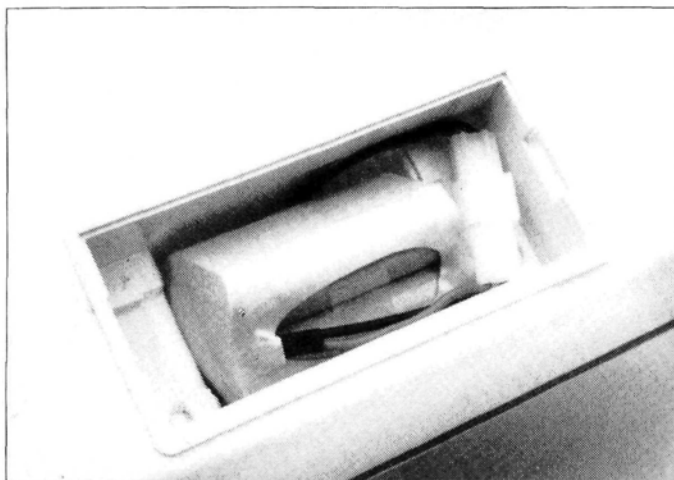
realistically viewed as a viable alternative—and it's going to get better from here!

The Union Model EP Challenger is one of a trio of ARF electrics distributed by United Model Distributors*. It's the group trainer, while its companions—the EP Champion and the EP Rocky—are designed to take fliers up the performance ladder after they've gained some stick time with the Challenger.

The first thing you must understand about the Challenger is that it doesn't pretend to be a high-performance electric—period! It *is*, however, a neat little airplane that offers a great deal as a basic, chuck-it-into-the-air-and-fly-it machine.

The kit is about as complete as it can be, and it only needs a radio and about 4 hours of assembly time to be flight-

For recharging purposes, molded battery compartment provides easy access to 6V pack.



ready. In addition to the geared motor unit and 6V, 600mAh battery pack, the box contains a timed quick-charger so you can replenish the charge from your 12V car battery. Consider purchasing a second pack so you can fly one pack while recharging another. We don't want to waste good flying weather, do we?

ASSEMBLY: EVERYTHING YOU'LL NEED TO KNOW

Assembly of the Challenger is covered in a 16-page, illustrated manual that explains everything in detail. Supplementing this is an eight-page "R/C Flight Manual" that takes you through the basics of flying, tells you about battery-charging technique and offers a troubleshooting check list. Want more? How about an illustrated parts sheet that lists those replacement parts that are sometimes required? It's clear that Union has done its homework on the documentation for this one and that it has kept the beginner in mind. The

remarkable thing is that we've all seen kits that are much more complex and are supported by *half* the instruction.

All the Challenger's airframe parts are of molded foam. The fuselage material is of the polystyrene "coffee-cup" variety, while the wing and empennage are thin sheet molded with color on one side that forms a hard, glossy skin. This fabrication technique allows the wing to have the equivalent of a high-lift, heavily undercambered airfoil that contributes

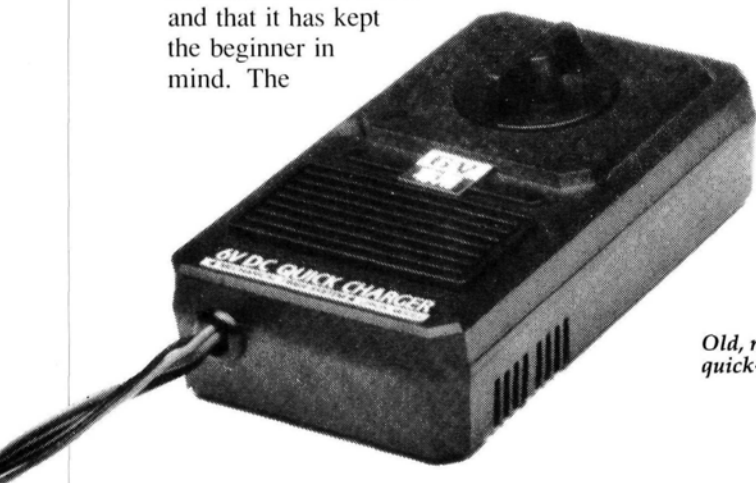
greatly to the Challenger's ease of flying.

There's nothing unconventional about putting the Challenger together. Epoxy, sandpaper, a screwdriver and a wrench are all included, and if you follow the instructions, you can't miss. I had some suspicions about the "stickability" of the clear "reinforce tapes" that were used to strengthen the wing near the root. They're simply Mylar-type material that didn't stick well to the wing's porous, foam under-surface. I had to re-stick them and the decorative decals frequently. Unless yours stick really well from the beginning, I recommend that you replace them with some other material, because when they come away from the wing's surface and start flapping in the breeze, they'll undoubtedly affect the airfoil.

I also removed the self-adhesive stickers from the fuse-



Old, reliable, no-frills Futaba 4-channel is shown with 6V quick-charger supplied with kit.



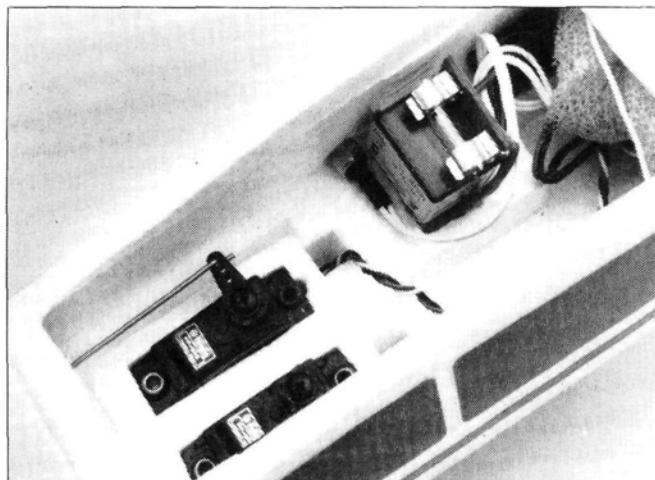
lage because they had become wrinkled and wouldn't photograph well. I painted the trim on the foam fuselage with some water-based acrylic paint, which I "borrowed" from my wife's craft box. Worked great!

To accurately guide the Challenger, I installed a "plain vanilla" 4-channel Futaba* Conquest radio with FP-S33 microservos. It has no dual rates, no exponential, no auxilliary channels, no mixing—nothing except good, reliable performance, and it's ideally suited to this application. The microservos reduce the weight slightly, and they fit right into the molded-foam adapter tray that fits right into the standard-size servo receptacle. Complete instructions are provided for installing four different brand-name radios, and others can be used by adapting the switch harness—another stumbling block eliminated for the beginner!

I accomplished all this in about 4 hours, and that includes the drying time for the paint on the fuselage and the 45-minute break-in run on the motor. The Challenger was ready to launch, so it was off to the field.

PEER PRESSURE

Flying with my group of buddies is a sobering experience. It's always a lesson in humility, either self-imposed or peer-inflicted. Comments like, "Finally got something you can handle, eh?" or "Hey, Stunning, just what kind of a jet is that, anyway?—an electric fan?!" Unaffected, I plugged the back-up battery pack into the quick-charger (I had previously charged the other pack), took my frequency pin and turned on the transmitter and receiver. After a final check of the control throws, I pushed the button to start the motor, and with no further fanfare, let the little Challenger fly right out of my hand. With that under-cambered wing working in the slight breeze, the Challenger climbed out moderately with just a touch of up-elevator. Since this is a 2-channel airplane, the rudder was quite effective for turning, and the wing's generous dihedral almost



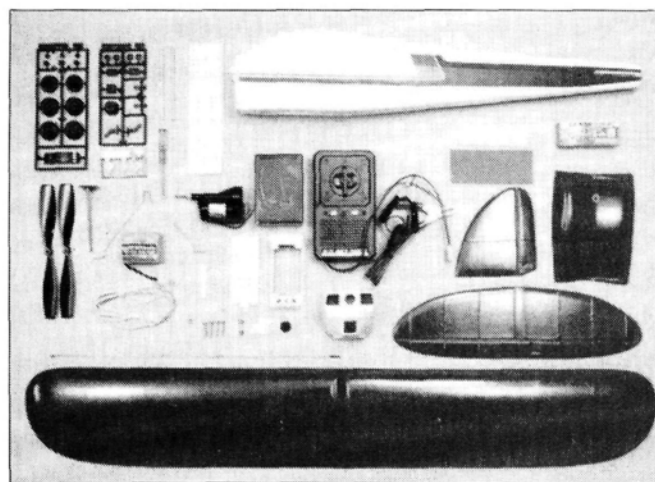
Radio compartment shows installation of Futaba microservos in pre-molded adapter tray. Unit to right of center is fused motor cut-off, which eliminates requirement for separate airborne battery pack to power radio system.

made for self-recovery when the turn command was released. I didn't time the motor run on the first flight, but when the airplane didn't seem to be climbing, I assumed that the motor had quit and that I now had a glider.

The Challenger is equipped with an Auto-Cut power system so that the propulsion battery can be used to provide power to the motor, the receiver and the servos. A motor cut-off point will terminate power to the

WIRE PROBLEM

The landing disclosed the only real shortcoming I found with the Challenger. The diameter of the landing-gear wire was too small to handle the landing loads adequately, and it will flex aft on every landing. There isn't enough elevator to provide the little extra flare on landing, but even after more than 30 flights, I've only had to straighten the wire. Nothing has bro-



Kit contents. Very complete right down to epoxy, sandpaper, charger and spare parts, i.e., prop shaft and prop.

motor, but sufficient power is left for the electronics, so you can glide around before landing.

A few turns with no altitude gain confirmed that the motor had, indeed, stopped, so I trimmed the elevator to provide a gentle descent and proceeded to glide around into position for landing. None of my buddies was flying—they were just watching!

ken or even been damaged. I'll probably replace the gear with something a little sturdier, but for the moment, it's doing the job.

On the second flight, I decided to go for max altitude to see just how high it would go on a full charge. Although I had no way of measuring either the altitude or duration, I had

(Continued on page 105)



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SIG 4 STAR 40

(Continued from page 81)

wide stance made the model stable on the ground, but its steering was rather sensitive owing to excessive tail-wheel travel. The first takeoff was consequently a zig-zag on the strip, but very steady in the climb.

Shortly after takeoff, I put in a few clicks of up-trim at the transmitter, and, right away, I felt comfortable with the 4 Star 40. Its light wing loading and moderate power made it very docile, so after only a few circuits, I was ready to slow it down for some photos. This airplane can really fly slowly: the controls remain effective and there's no risk of a tip stall. Any tendency to stall was straight ahead and at remarkably low speed, and its landing approach was very steady, with a low sink rate and a soft touchdown on the main wheels.

During the rest of the flights that day, I explored the Star's aerobatic range. Although it isn't intended for pattern competition, it easily accomplished all the typical sport-airplane maneuvers. The 4 Star 40 tracked very well through all looping and rolling maneuvers, and very little down-elevator was required for sustained inverted flight. Low-speed snap rolls feature a clean break with a positive recovery on heading. Vertical performance with the .48 4-stroke engine was adequate, but not exciting; however, I've seen a 4 Star with a hot .46 2-stroke engine, and its climb was literally unlimited.

Since that first day, the Sig 4 Star 40 has given me several enjoyable hours of flying. With its easy construction and wide performance range, it can satisfy the needs of most sport modelers and proudly take its place in the R/C constellation.

**Here are the addresses of the companies mentioned in this article:*

Sig Manufacturing Co., 401 S. Front St., Montezuma, IA 50171.

Carl Goldberg Models, Inc., 4734 West Chicago Ave., Chicago, IL 60651.

Fulaba Corp. of America, 4 Studebaker, Irvine, CA 92718.

Hobby Lobby International, P.O. Box 285, Brentwood, TN 37027.

Hobbypoxy; a division of Pettit Paint Paint Co., 36 Pine St., Rockaway, NJ 07866.

Coverite, 420 Babylon Rd., Horsham, PA 19044.

O.S./Great Planes Model Distributors, P.O. Box 4021, Champaign, IL 61820. ■

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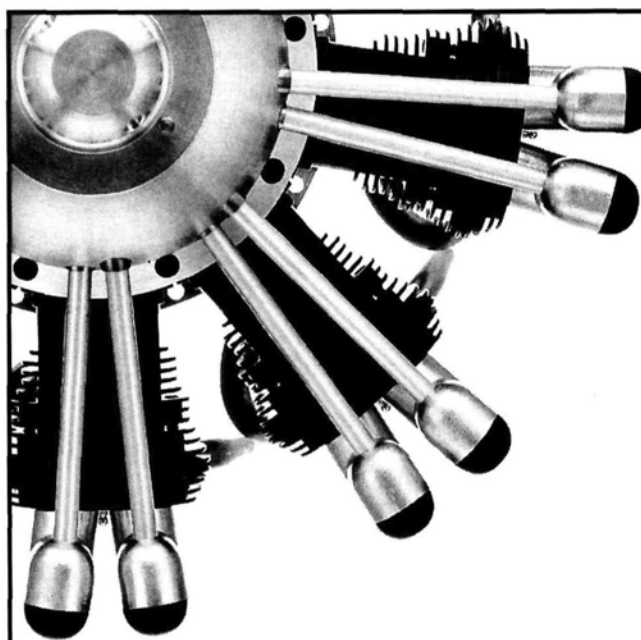
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OPS FAN 80

(Continued from page 53)

The editor's interest in this aspect is understandable; a large, rigid dynamometer isn't the same as a craft—car, plane or boat. Ducted fans have their own sound envelope, as do cowled-in large-scale engines. The proposed tests are somewhat removed from the real craft and the world they inhabit. Nevertheless, the controlled standard conditions provided by the dynamometer test facility seemed too good to miss, so certain sound-level readings have been included in my reports.

These first readings really represent an opening shot at establishing the method. The findings are less relevant because of engine demise at 22,000rpm (the 9x6 propeller threw one blade, and the engine's front housing failed to take the subsequent—very large—unbalanced centrifugal load of about 1/4 ton.

Before this, I had obtained a fine set of figures at lower rpm—using an 11x7 Master, which rotated somewhat short of full resonance, so the dB figures are lower than those likely at the 20,000-plus rpm of the real peak.

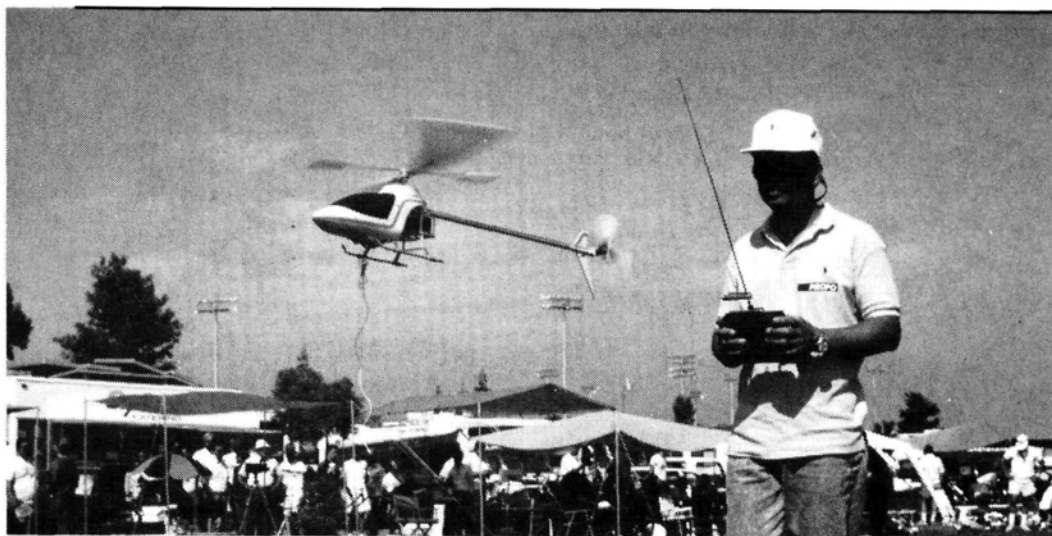
Subsequent attempts to reach this peak succeeded only too well, as described, and it was clearly hazardous to expect that the 9x6 Master would hang together long enough to give the various readings. It's surprising that it held for approximately 40 seconds before disintegrating at 22,000rpm. Failing the fitting of an actual fan unit onto the engine, when faced with the very high rpm of these ducted-fan engines, I'll have to use prepared propellers (e.g., 12x6 wood, cut down to about a 9-inch diameter) and thus gain the large-section hub that's clearly required.

I must mention that the OPS 80 managed to reach a cool 4hp at 18,900rpm using the quiet pipe and 5-percent-nitro fuel. Thus, the OPS claim of 4.5hp using the more powerful non-quiet pipe and 50 percent nitro seems distinctly conservative—a more likely figure is around 4.8hp.

SUMMARY

The OPS factory still maintains a close contact with and interest in the world of competitions, where their products are most used, and where the hardest lessons are learned. OPS engines are as reliable as it's reasonable to expect, given the power levels at which they operate. The OPS 80 fan engine is from the same background, and it proved to be a solid, strong performer in what was, however, a slightly shortened test schedule. ■

HELICOPTER SECTION



90 Rotary-Wing Roundup

92 Springtime Heli Maintenance

95 Helicopter Challenge

98 Radio Review: Airtronics Spectra PCM 7H



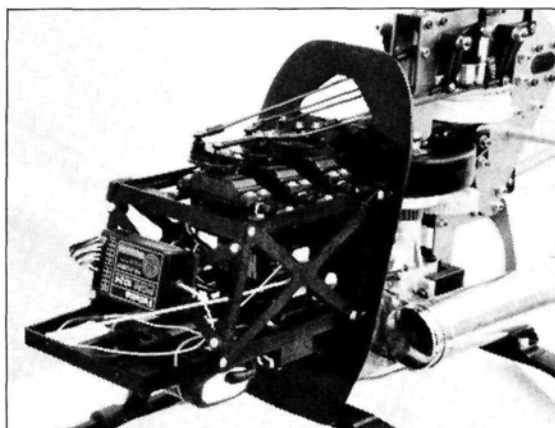
ROTARY-WING ROUNDUP

ROBBE Servo Support Structure

Robbe's new servo support structure consists of injection-molded plastic parts that can be assembled quickly to form a light, compact unit. This specially designed framework produces a very rigid structure that accommodates the receiver battery, the gyro and servos. The upper level of this structure is designed for System 88 mechanical collective pitch mixer. The unit is standard on the Magic, and it can be fitted to the Scout 60.

Part no. S2834

For more information, contact Robbe Model Sport, 180 Township Line Rd., Belle Mead, NJ 08502.



MINIATURE AIRCRAFT Peacemaker Tuned Exhaust

The Peacemaker Tuned Exhaust Systems are very light, have a very low sound level and offer measurable power boost. Available for all .30-, .50- and .60-size engines, Peacemaker Systems provide excellent ground clearance and fitment to scale applications.

For more information, contact Miniature Aircraft USA, 2324 N. Orange Blossom Trail, Orlando, FL 32804.

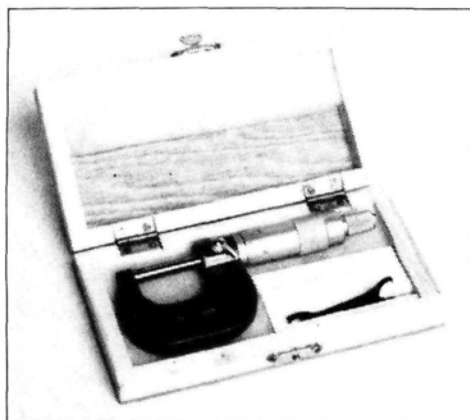
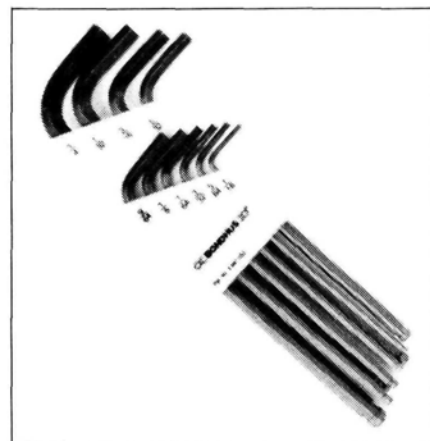


BONDHUS Hex Key Set

Bondhus introduces a new, 10-piece set of balldriver hex-key L-wrenches, which make maintenance and assembly faster and easier. Sizes are $\frac{1}{16}$, $\frac{5}{64}$, $\frac{3}{32}$, $\frac{7}{64}$, $\frac{1}{8}$, $\frac{9}{64}$, $\frac{5}{32}$, $\frac{3}{16}$, $\frac{7}{32}$, $\frac{1}{4}$, $\frac{5}{16}$ and $\frac{3}{8}$ inch. The set is packaged in a Bondhex case that identifies the tool sizes and locks them into place for storage and easy access. The hex key's patented design allows angled entry to fasteners to 25 degrees.

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For more information, contact Bondhus, 1400 East Broadway, Monticello, MN 55362.



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For more information, contact K&S Engineering, 6917 West 59th St., Chicago, IL 60638.



HOBBY DYNAMICS Century 7 FM Single-Stick Heli

With all the features of the Century 7 FM Dual-Stick System in a single-stick mode, you can't lose. The system includes: ABC&W receiver; four JR 501 servos; rechargeable transmitter and airborne Ni-Cds; Ni-Cd charger; plug-in transmitter RF module; complete servo accessories and hardware. The system offers servo-reverse, dual rates, exponential, ATV, ATS, direct servo controller, trainer system, throttle hold, throttle hover, high idle, inverted flight system, adjustable pitch curve and idle-up.

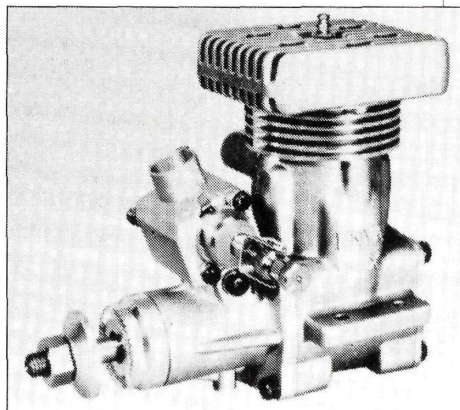
Part no. J7FHS. Price: \$649.99

For more information, contact Hobby Dynamics Distributors, 4105 Fieldstone, Champaign, IL 61821.

ENYA 80XF-H Engine

Following the Enya tradition of putting power into small packages, Altech is proud to announce the 80XF-H engine. This .80-cubic-inch engine fits the same mounting dimensions as the 60XF-4 engines, but it has more torque for bigger helicopters. The Schnuerle-ported, side-exhaust engine has a steel cylinder with an aluminum piston and a steel piston ring. Each engine comes with the renowned GM-10S carburetor, which is adjustable in high-, mid- and low-end throttle speeds for superb performance. This miniature powerhouse produces 1.6 to 2.0hp at up to 16,000rpm, weighs 19.7 ounces and can lift helicopters weighing up to 13.2 pounds.

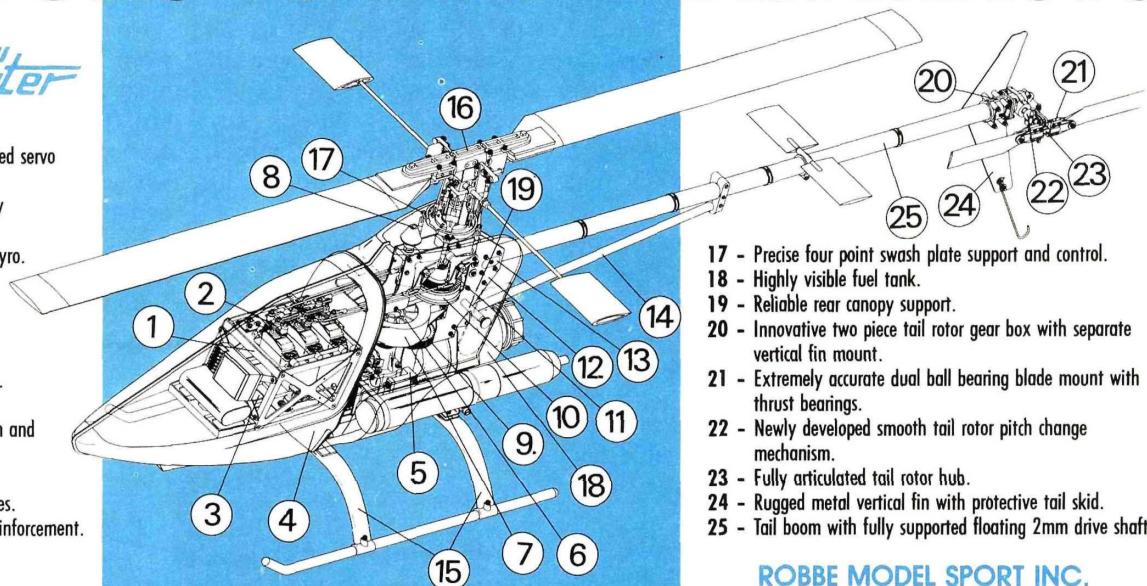
For more information, contact Altech Marketing, P.O. Box 391, Edison, NJ 08818.



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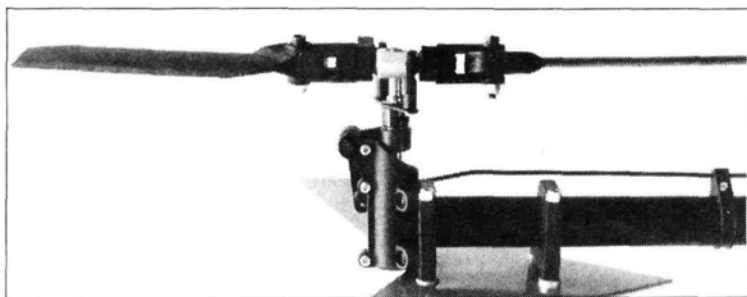
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SPRINGTIME HELI MAINTENANCE

Getting ready for the new flying season

ALTHOUGH SOME of you live where it's warm enough to fly helicopters year-round, most of us can only dream of flying while we wait for spring. I hate to take my helicopter to the field only to discover that it's not ready to fly, so I've developed an inspection checklist to ensure that everything is in perfect operating condition before "opening day." (This list isn't necessarily complete; modify it as needed depending on your particular helicopter.)

Helicopter—Put your helicopter on a table and start your inspection at the nose.

Canopy—Remove the canopy and check for any cracks or splits, especially at the seams if it was glued together. The rubber mounting grommets, latches, etc., should be in good condition and not worn from vibration.

Servo tray—Check for cracks in metal trays, or for poor glue joints in wooden

ones. Twist and push/pull gently to make sure that the tray is solid and mounted well to the frame.

Pushrods—Check the ball links for wear, and make sure they fit snugly. Replace as needed, and make sure all pushrods are straight.

Bearings—Check for smooth operation. Oil, or pack with bearing grease as needed.

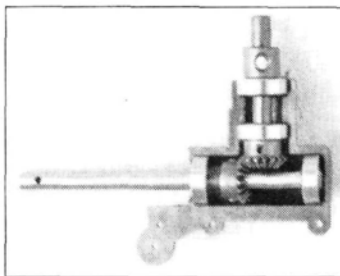
Landing gear/skids—Make sure that these are secure and straight. If made of metal,

clean and check that all nuts and bolts are secure. Look for vibration or stress cracks around the engine and skid mounts.

Head—Although it's not really necessary, it may be a good idea to remove the rotor blades and head. If it has been a while since you greased the thrust bearings in the blade holders, do so. Using a HighPoint* or DuBro* balancer, check the balance of the head/flybar.

Rotor blades—Check for worn mounting reinforcements, cracks, warps, scraped tips, etc., and repair or replace as needed. If you're using wooden blades and have any doubt about their condition, remove the covering and inspect the wood itself.

Boom—If the tail rotor is



Because the tail-rotor gear train rotates at high speeds, it should be disassembled and lubricated after long periods of disuse.

they may need to be bent back into position so that your helicopter sits straight and level on the ground.

Frame—Wipe the frame

wire-driven, re-lubricate the drive wire. If it's belt-driven, check the belt for signs of wear and adjust the tension.

Tail-rotor gearbox—All

gearboxes should be disassembled, inspected and re-lubricated.

Fuel tank—You shouldn't store your helicopter with fuel in the tank, but if you did, remove it now. Check all fuel lines inside and outside the tank to make sure they're secure and not clogged. Check for holes or splits that will cause the engine to run erratically. The clunk weight should be secure to its tubing and free to move—especially if you plan to fly inverted.

A general cleaning and polishing, plus a touchup of any bad paint areas, will make your helicopter look like new.

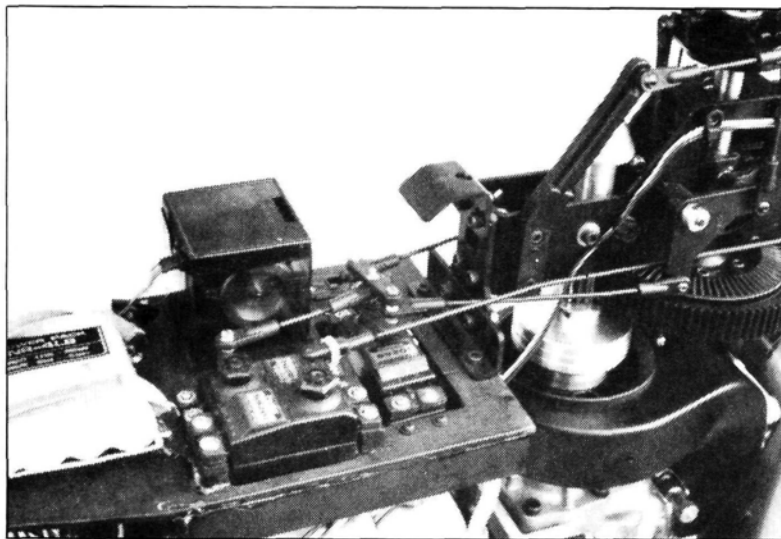
Radio—Carefully check the connectors and wires for any breaks, frays, etc. Look

closely at where the wires go into the connectors: if they've been pulled on, they may have become dislodged.

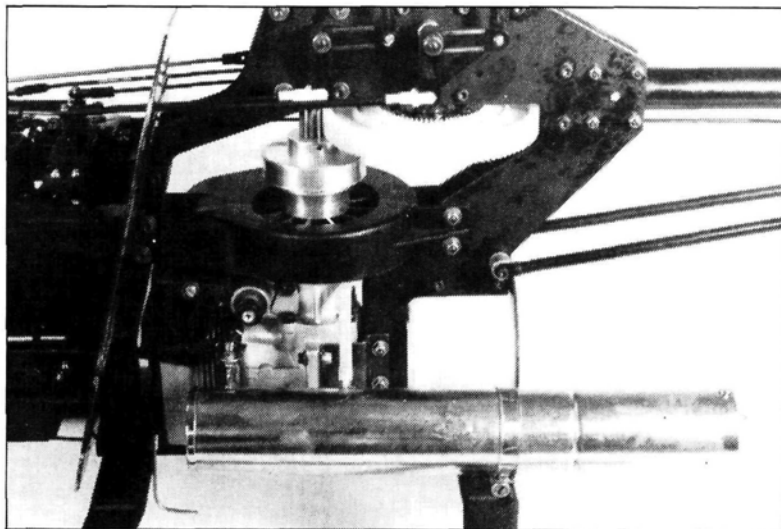
- Cycle/charge all batteries to check their capacity.

- The rubber servo grommets should be secure between the servo and tray, but not so tight as to negate their vibration protection. Check the foam rubber that protects the receiver, battery, etc., and replace as needed.

- Servo arms are subjected to a lot of stress in a summer's flying. Make sure



PHOTOS BY PAUL TRADELUS



■ **Top:** There's a lot to be inspected in this area of your heli, especially before the new season. Check that the servos, control linkages, battery pack and gyro are secure and operating correctly. ■ **Bottom:** The engine, muffler, gear train and drive systems are the heart of your propulsion system, so take care of them.

they have no cracks or enlarged holes.

- Be sure the antenna is free of cracks, rubs, etc. Any minor problem with the wire covering can be corrected by putting a small piece of heat-shrink tubing over the bad spot.

- When everything looks good, give the entire system a range check, with the heli configured *exactly* as you're going to fly it. Don't route the receiver antenna differently or remove the canopy (or any other piece of the helicopter),

as you may not get an accurate range check. Compare this to the distance you were getting last season, and verify that it's more than the minimum recommended by the manufacturer. If your radio doesn't pass this check, *don't* start the engine! A radio problem won't cure itself, so have a qualified technician check it.

Gyro—Again, check the wiring and connectors. With the radio turned on as for flying, check for proper servo

(Continued on page 106)

Helicopter Challenge

by CRAIG HATH

UNDERSTANDING CONTROL SYSTEMS

NOW THAT YOU'VE assembled the basic components of your kit, you're ready to install and connect the radio system. At first, this can be very confusing, and even frustrating. Although you don't really need to understand what each control is doing to properly integrate the radio into the rest of the helicopter, it helps if you have some basic knowledge of how the controls work. The instructions in some heli kits help you connect linkages to bellcranks and servos, and they include diagrams of what each control does. By looking at the basic controls of the typical R/C helicopter, I can quickly describe the action each control addresses, and relate that back to the radio transmitter.

THROTTLE

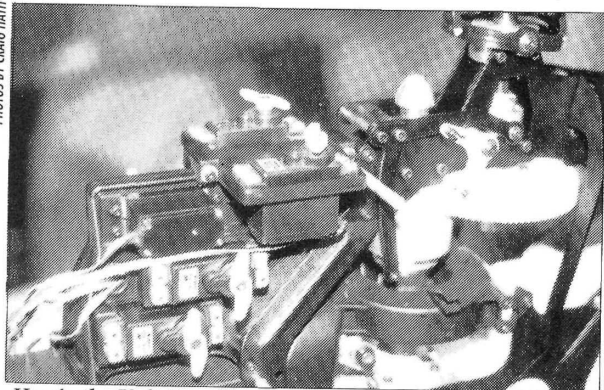
The throttle servo is connected by linkage to a lever on the carburetor of the engine. On all R/C systems designed for helicopters, the throttle servo is electronically mixed to move along with at least the collective servo, and probably the tail-rotor servo (as would be used with an anti-torque tail-rotor system). If your

transmitter is Mode 2, the throttle/collective stick will be on the left when moved up and down. (Mode 2 is the most common configuration for U.S. R/C systems, so it's the one to which I'll refer throughout this article.) Set the direction of throttle throw so that the throttle barrel opens as the stick is moved upward. The throttle should be completely open just as the stick is moved to the end of its travel; likewise, the throttle barrel should be completely closed just as the stick is moved to the extreme low position. Think of the throttle as the source of power, and mentally separate it from the collective pitch. Although the throttle and collective pitch operate from the same control, they actually perform two different jobs.

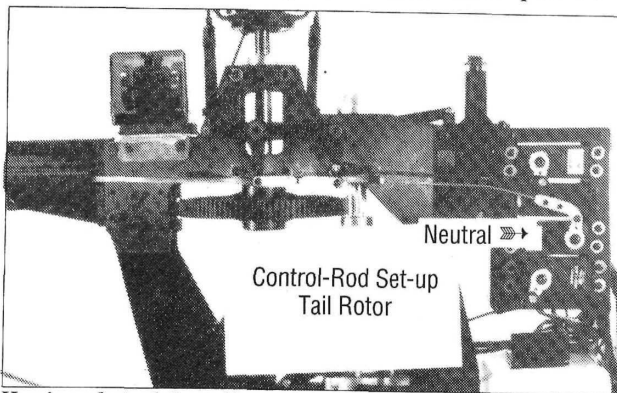
COLLECTIVE PITCH

Collective pitch describes the action that changes the main rotor blades' angle of attack. The collective-pitch function can be connected to its servo in one of several ways, so read your instruction manual to determine which lever (or bellcrank, etc.) is the hook-up point. Along with the throttle, the collective is controlled by moving the left stick up and down. Main rotor-blade pitch (or angle of attack) is increased as the stick is moved from low to high. On a collective-pitch helicopter, the main rotor speed is

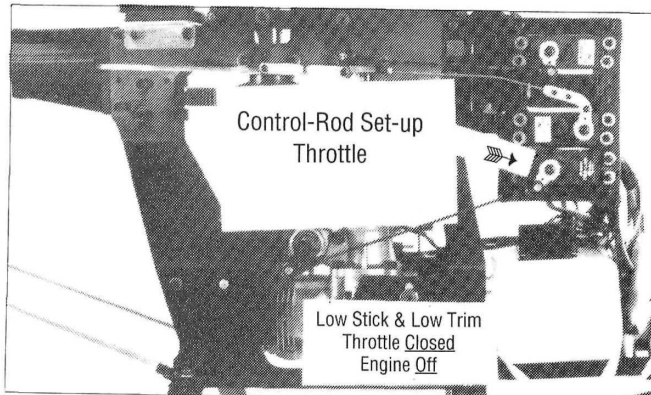
PHOTOS BY CRAIG HATH



Here's the Kalt Excalibur with servos installed, just before making linkages and hooking everything up. Note the attachment points for throttle, collective pitch and roll-cyclic pitch.

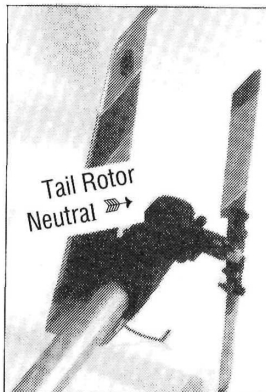


Here's a shot of the tail-rotor-pitch linkage on a Hirobo/GMP Stork. Notice that the servo arm is aligned so that neutral is straight up.



Control-Rod Set-up
Throttle

Low Stick & Low Trim
Throttle Closed
Engine Off



Tail Rotor
Neutral

Left: Throttle linkage on the Stork is typical of most helis; be sure to use a servo arm that's long enough to provide full throttle travel.

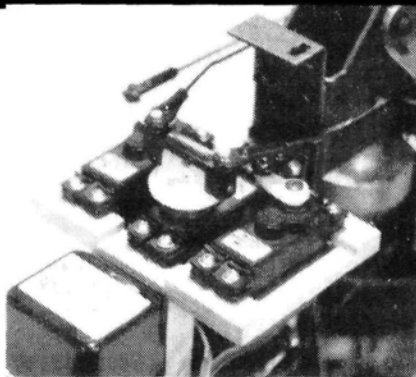
Right: Notice the neutral position of the Stork's tail-rotor blades. This slight amount of pitch is what most machines require to hold the tail boom stationary in hover.

HELICOPTER CHALLENGE

kept fairly constant because variations in throttle are accompanied, automatically, by similar variations in blade pitch. The increased pitch converts the power into lift, and this causes the helicopter to rise. Try to think of collective pitch as the control that governs lift, or makes the helicopter rise or fall.

CYCLIC PITCH

Cyclic pitch is controlled by two independent control functions known as fore-aft cyclic pitch and roll-cyclic pitch. Like collective pitch, these func-



This is the roll-cyclic-pitch mixer used on the GMP Legend. This system allows you to pull the roll-cyclic levers for control in either direction, and it prevents any load on the linkage that would allow the pushrod to bend or flex. (This could happen if the control were pushed in one direction and pulled in the other.)

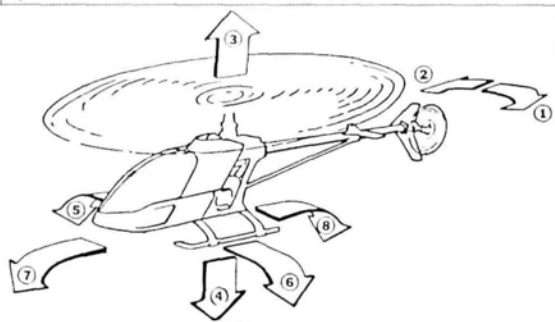
"Imagineering"—the crashless way to practice!

ONE OF THE MOST important pieces when solving the puzzle of R/C model helicopters is getting a feel for the controls. To become proficient at flying a helicopter, you must train the muscles in your hands to react to what your eyes see. There's only one way to learn this hand/eye coordination, and that's by doing it. To this, you might say that you'll never learn to fly a model helicopter, because you can't keep it together long enough to get in that all-important stick time!

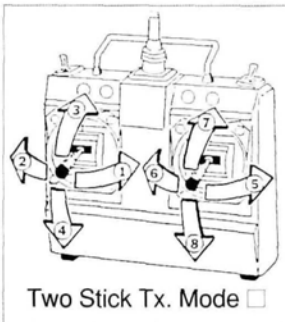
Well, how about trying an exercise I used when I was first learning to fly model airplanes, and then used again when I made the plunge into model helicopters. I call this exercise "imagineering." You fly your model in your mind while you sit comfortably on the living room sofa with your model perched safely on the coffee table. This may sound quite bizarre—or even childish—to some of you, but it's very effective!

Hold your transmitter in your hands and envision the helicopter lifting off while you operate the controls on the radio just as if you were actually at the field. Push the throttle open a little more, and think of the helicopter lifting slightly. Push the cyclic stick forward just a hair, and imagine that the nose dips down and the helicopter moves away from you. Watch that tail rotor now; don't let it get the best of you! Set the machine back down on the ground by easing back on the cyclic and reducing power slightly.

Sound like fun? It is fun, and it will help you to keep those fingers nimble and to speed up the learning curve. I've seen champion model fliers do this many times before a competition; it's not unlike the pre-game concentration that many athletes employ so successfully. Try it—you might find that this is just the ticket for you!



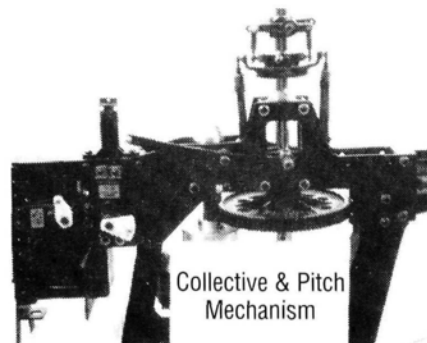
This is part of the illustration included in the Miniature Aircraft USA X-Cell instructions. Relate the number of the control being moved in the direction shown to the movement of the helicopter, and you will soon have a good mental picture of how to control the machine.



Two Stick Tx. Mode ☐

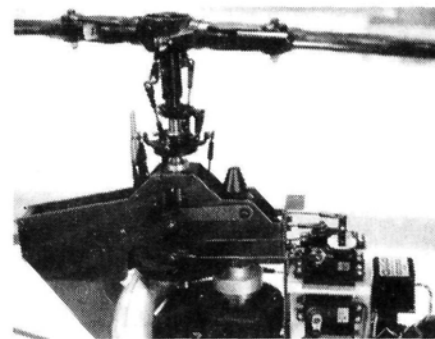
tions can be connected to their respective servos in many ways, so consult your manual to be sure you do this correctly. Simply stated, cyclic pitch steers the rotor head, or rotor disc, through the air by tilting the flybar paddles (known as Hiller-only steering), or by altering the pitch of the rotor blades (known as Bell steering). Combining these systems results in what's called "Bell-Hiller mixing."

To confirm the proper operation of cyclic pitch, move the right control stick forward and watch the swashplate on the helicopter. The front of the swashplate should tilt toward the front of the helicopter, which should make the helicopter move for-



Above: Multi-level cyclic-pitch system as it hooks up to swashplate on the Legend. Simple, positive linkages like this make a helicopter reliable and easy to control in any attitude.

Below: Collective-pitch mechanism on the Stork. Linkage is removed to show ball links at both ends—a good way to help rid system of slop.



ward. Next, move the right control stick to the right; if you're standing behind the helicopter, the swashplate should tilt to the right, which causes the helicopter to move to the right. In short, the right stick (on Mode 2 radios) moves the helicopter in the direction in which it's pushed. Try to remember that cyclic pitch controls the direction of the rotor disc, not that of the helicopter.

(Continued on page 106)

RADIO REVIEW

AIRTRONICS SPECTRA

PCM 7H

14

**Tailored for the
heli flier, this one
has all the ability
you'll ever need**

by PAUL TRADELIUS

MODEL HELICOPTERS perhaps benefit more from the “bells and whistles” of today’s modern radios more than any other form of R/C. “Bells and whistles” means the many switches and adjustments offered by today’s radios; they allow pilots to “customize” control in particular maneuvers, and they make helicopter flying much easier and more enjoyable. You can fly a helicopter with a plain 4-channel radio, but radio manufacturers have responded to the requests of fliers by providing radios that have been engineered to make our hobby as easy as possible.

The predecessor to the Airtronics* Spectra PCM 7H is the Module 7H (or 7HI, for inverted capability), which I’ve been flying for more than a year with flawless performance. This is Airtronics’ first venture into the PCM helicopter radio field, and I knew it would be a product into which the company had put a lot of design effort.

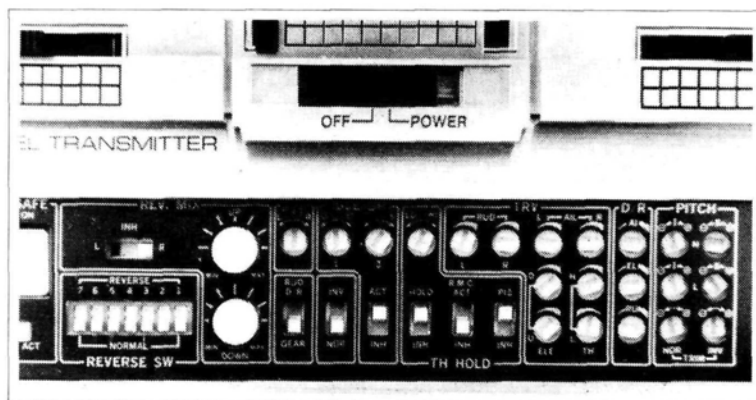
When the radio arrived, it



Although it seems to bristle with switches and knobs, the Spectra PCM transmitter is well-balanced and easy to handle. Dark lower section is acrylic access panel cover.

was everything—and more—that I expected. When we open the package of a new radio, I assume we all immediately want to examine its contents and play with all the switches and knobs on the transmitter. I always try to curb my enthusiasm and discipline myself to find the instruction manual and read it from cover to cover—even if I think I already know how

everything works. In fact, one of my complaints with most instruction manuals is that their writers assume we already know what we’re doing, and they only explain the specifics of their particular radio. I’m very glad to report that Airtronics takes a totally different approach: the instructions are written with the assumption that we’re all beginners who need to be



Control panel on lower portion of transmitter contains all the potentiometers, servo-reversing and inhibit switches to allow nearly infinite, user-determined, adjustments.

taught the basics of radio. Airtronics consequently includes two manuals with each radio: one deals with "Installation Fundamentals and Guidelines," and the other is more specific and tells you all about the radio you've bought.

The 12-page "Fundamentals and Guidelines" manual gives you information on how to install your radio properly and operate it safely. Nothing is taken for granted, and this approach is great for beginners. I think this is important, because even though this is a full-feature radio, you can still learn with it by turning off some of its more advanced functions. Those advanced capabilities will then be available as your flying progresses. This manual will certainly get you started on the right track, and it may even teach more experienced fliers a trick or two. (No matter how much I learn, there's always more.)

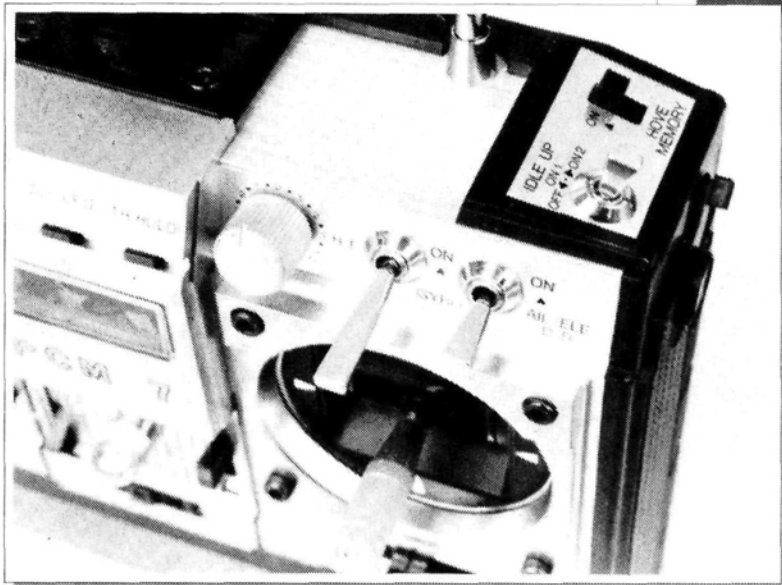
The more specific manual deals with the Spectra PCM 7H, and its first section is devoted to "Safety First for Yourself and Others." With so many newcomers in the helicopter field, safety can't be overemphasized, and Air-

tronics deserves praise for dealing with the subject first, and not burying it in the back of the book somewhere. (You should be getting an idea about where I stand on flying safety!) There's also an easy-to-read, very understandable troubleshooting chart, which will help you enjoy the Spectra PCM 7H on your very first flight. But let's take a closer look at the radio.

pick it up, you'll notice its heft and good balance. The switches are all easy to reach, and the side panels and the back are of black plastic that has a molded-in non-slip surface that allows you to grip the radio easily.

One relatively small feature that's standard with this system is the pot-adjustment tool that can be attached to the transmitter's carrying handle

Upper right corner of transmitter showing dual rate, idle-up, hover memory and gyro-disable switches.



TRANSMITTER

The heart of any R/C system is the transmitter, and this is certainly true of the Spectra PCM 7H. As soon as you

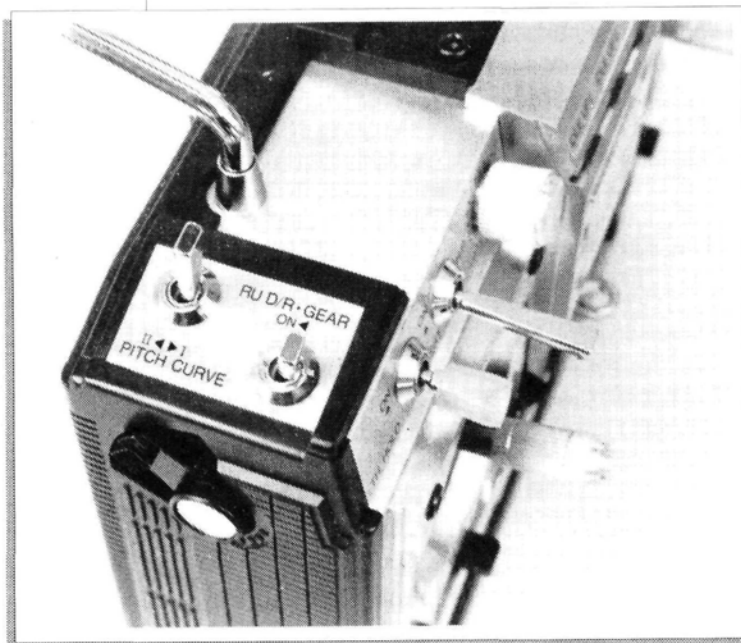
(in its own little carrying case) so that it's readily available when you need it. The panel's flip-down cover (which is on the lower part of



Upper left switch group activates throttle hold, invert, pitch curve, and dual-rate functions.

the transmitter's front) is easily accessible while flying (using a neck strap or a tray). Just snap off the adjustment tool, flip down the front cover, and you're soon ready to make any required adjustments.

Idle-up 1 or 2. Idle-up 1 can be used to maintain rotor speed during normal descents, and idle-up 2 can be used for aerobatic maneuvers, which require a constant high rotor speed during fast forward flight, rolls, etc.



Close-up of upper left portion of transmitter. Switch similarity could cause problems until user is familiar with locations and "feel." Author used slip-on extensions to distinguish between close switches.

Two Idle-Ups—On the top right side of the transmitter is the three-position idle-up switch, which gives you the choice of normal throttle con-

Two Pitch Curves—The top-left rear switch has two positions to give you the collective pitch curves. I like to set the first pitch curve in the

range of -3 to +8 degrees (normal flying), and I have the second pitch for autorotations using about -5 to +10 degrees. To adjust the high and low collective-pitch settings quickly and easily for each of the two pitch curves, there are four individual adjustment pots under the front panel. A separate pot adjustment marked "normal trim" lets you move the entire pitch range up or down, as required, and it gives you another way to adjust the hovering stick position.

Collective-Pitch

Adjustments—When you've set the pitch curves, you might have to fine-tune your helicopter according to the day's weather, your engine speed, the type of flying you want to do, etc. The Spectra PCM 7H has three additional collective-pitch trim adjustments with which you can do this. On the left of the transmitter, there's an adjustable trim lever with which you can fine-tune only the most negative collective pitch without affecting the other settings.

In a similar way, the right of the transmitter has another trim lever with which you can slightly adjust the maximum collective-pitch setting without affecting the other settings.

You'll find the third collective-pitch trim adjustment on the face of the transmitter; it's just to the right of the meter and is marked "H.P." This stands for "hovering pitch trim" and, as the name implies, it's used to fine-tune the hovering collective pitch.

This system gives a pilot the ability to fine-tune his helicopter's performance and "feel" quickly and easily,

without making the more coarse adjustments using the trim pots under the front panel.

Throttle Hold—The top-left face of the transmitter has the throttle-hold switch, which holds the throttle at a predetermined setting, yet has the complete collective-pitch range available with the "throttle stick." This enables you to practice autorotations without killing the engine; and an adjustment pot under the front panel provides easy access for adjusting the throttle position. If the hold switch is accidentally activated, you can disable it with the inhibit switch that's under the front panel.

Inverted Flight—Next to the throttle-hold switch is the inverted-flight switch, which, when activated, electronically reverses the elevator, the tail rotor and the collective-pitch controls on the transmitter. This enables you to fly the helicopter inverted with the same control movements as if it were upright. Under the front cover, there's an inverted-trim adjustment that again moves the entire inverted-pitch range so that the helicopter will hover at the same stick position while inverted as it does when upright. Again, an inhibit switch under the front panel can be used to disable the inverted function if the switch is accidentally activated.

Hovering Throttle—Just to the right of the signal-strength meter is the hovering throttle knob, which allows you to fine-tune the engine speed and, therefore, the rotor speed, while in the hover position. When used with the aforementioned hovering-

pitch adjustment, this knob enables you to fine-tune your machine's hovering performance more accurately.

Revolution Mixing

Again, under the front panel, there's a switch with which you can activate this function for either a right-(clockwise) rotor system or a left-(counterclockwise) rotating system, plus separate up and down adjustment pots.

This revolution mixing system automatically adjusts the tail-rotor servo for climbing and descending to counter the changes in torque produced by the main rotor blades. This enables the helicopter to climb or descend straight ahead without any tail-rotor input from the pilot, so it makes flying easier and more enjoyable.

Hovering Memory—This switch is located on the top right of the transmitter, and it's activated when the helicopter is hovering to tell the radio from which throttle-stick setting it should start the revolution mixing. This is another piece of fine-tuning equipment; it enables you to hover at any desired stick position, and the radio will apply the climbing or descending tail-rotor mixing from that point.

PCM Fail-Safe—I don't want to get too technical and discuss the electronics of Pulse-Code Modulation (PCM), but I will say that it provides a better link between the transmitter and receiver. It also gives you the choice of using a "fail-safe" mode of operation or not. When using the fail-safe feature, if your radio signal is interrupted (commonly called a "glitch"), the radio will

maintain the servo position of the last-known good signal, so your helicopter will (we hope!) ride out any interference without bouncing around the sky.

R.M.C.—While performing autorotation landings, the tail rotor may need to be re-trimmed because of the sudden loss of torque from the main rotor. The tail rotor may also need to be re-trimmed in fast forward flight at high power settings using the idle-up 2 function. Remember, the revolution mixing system provides an additional tail-rotor input to counter the increased torque when climbing, or at high power settings.

This tail-rotor input isn't needed during fast forward flight because of the increased efficiency of the vertical fin in keeping the nose pointing in the right direction. With the R.M.C. switch (I think this stands for "Rudder Manual Control") in the "activate" position, you're able to trim the tail rotor for both autos and fast forward flight when in idle-up 2. With the R.M.C. switch in the "inhibit" position, you may still trim rudder with the provided adjustment pot, but now, it's only activated when you're using the idle-up 2. This is a very useful feature, because it eliminates unwanted yaw and provides more usable power for the helicopter, since the engine is no longer providing unnecessary power on the tail rotor.

Of course, the Spectra PCM 7 has all the "standard" features you'd expect—a plug-in frequency module, dual rates, servo-reverse on all seven channels, servo-throw adjusts, etc.

(Continued on page 109)

JET BLAST

Fuel systems, new projects and AFTERBURNERS!!

by guest columnist BILL HARRIS

THIS LAST flying season was pretty painless with lots of flying and no major crashes, although I did lose my J.M.P. Phantom at a contest. I've been told that they *all* crash sooner or later—I just wish it was *much* later!

Sooner or later, everyone has trouble with fuel systems. I use the same system on all my planes: pipe pressure to the main tank; carb line to the pipe pressure on a small 1- or 2-ounce "sump" or hopper tank that fits as closely as possible to the carb of the engine; and, finally, carb from small tank to the engine. This has worked very well for me,



Rod Snyder of Johnson City, TN, showed up at the Superman Fan Fly with this colorful Yellow Aircraft A-4 Skyhawk. Kit is available with pre-sheated, scale (small) wing or in oversized (but accurate in planform) version shown here.

and it eliminates bubbles that appear when going from inverted to upright, and vice versa. There are always variations though: Byron Originals* has its own tank and filler system, which works

well in their jets. Bob Violett Models* uses saddle tanks with a "Y" from the tuned pipe to the tanks and another "Y" to the carb from the tanks.

Refining the system takes

a little planning. Here are some tricks that I've learned over the years:

- Locate your tank so that it's as near to the CG as possible.
- Get the pressure line out

AFTERBURNERS!

by RICH URAVITCH

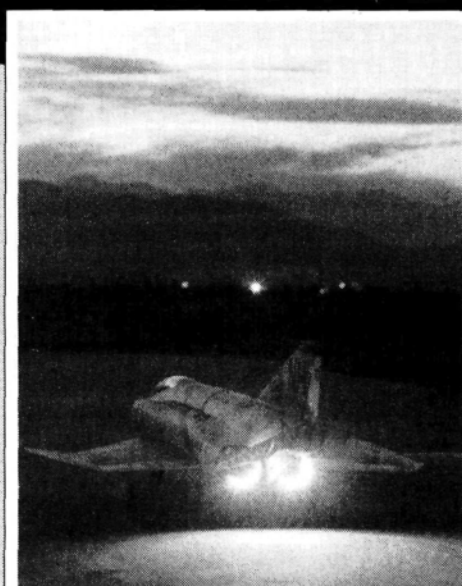


Bill Prentice with his beautifully done F-4J built from the JHH kit; one of the most accurate around.

JET MODELERS WHO prefer to build scale seek the same type of authenticity that every scale modeler does. Things like releasable ordnance, operating drag chutes and wheel brakes are

finding their way into many of the scale jets we see today.

Bill Prentice of Englewood, CO, was looking for something just a little unusual to add to his JHH F-4J Phantom. What did he decide on? How about afterburners?! No, they aren't really functional, but we're sure you'll agree that they look great! The system consists of 24 high-intensity flashlight bulbs that are wired to illuminate when Bill advances the throttle on the Dynamax/O.S. .77 past the $\frac{3}{4}$ position. They "don't do much for the thrust, but they sure do look authentic," said Bill, who also equipped his Phantom with retracts, operating gear doors and flaps. To give you an idea of what an outstanding job he did, we've included a daylight shot of Bill with his machine.



This is about as realistic as it gets! Bill Prentice's F-4J with its complement of 24 high-intensity bulbs illuminated to simulate A/B. Could be a late '60s early-morning launch from Da Nang!

COMING ATTRACTIONS

by RICH URAVITCH

of the duct as soon as is practical to reduce duct drag.

• *Always*, and I mean *always*, use a grommet whenever the fuel line is passed through a fiberglass duct on a wooden bulkhead. Sooner or later, it will cut through the tubing. (I buy grommets by the bag at the auto-parts store.)

• Last, but not least, I "colorize" my fuel system. I use the pink Prather* tubing for the fuel line and the blue Aerotrend* tubing for the pressure line. By doing this, you'll never fumble for the wrong tube inside the plane.

ABLE TO LEAP TALL BUILDINGS?

Last October, I covered the first annual "Superman" Fan Fly in Metropolis, IL. Metropolis is on the north shore of the Ohio River across from Paducah, KY. It's a super-clean town with friendly folks who are proud that it's the home of Superman.

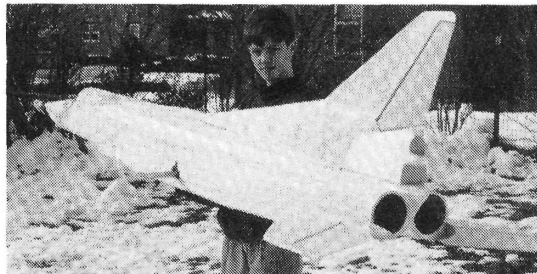
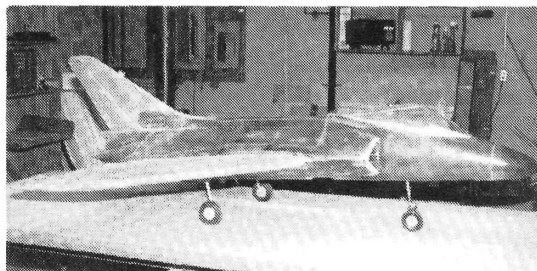
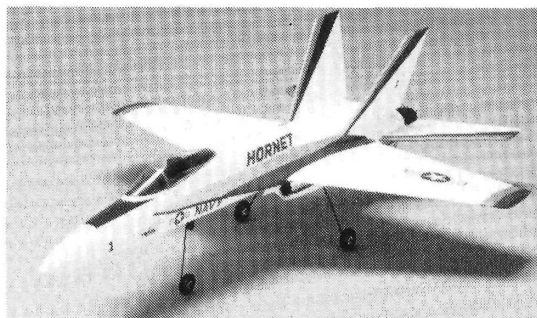
The event was hosted by Jerry Caudle and his wife, Liz, and the site is one of the nicest you'll ever see. Jerry runs the F.B.O. at the airport, and his model runway is 3,000 feet long and 100 feet wide. On Friday, it rained all day, but the weather was super on Saturday and Sunday. Pilots came from as far as Massachusetts and Florida. On Saturday, Dennis Crooks bought his F-14 Tomcat and put on a masterful flight, and Don Kanak "wowed" the crowd with his SR71. These planes are from Yellow Aircraft* and will be available soon. The fast pack was there, too: the Viojett crew and the boss himself, Bob Violett, who

JETS HOLD A fascination for modelers, and the relatively small number of available kits seems to provide the motivation for some really creative designing and scratch-building. We're not likely to run out of subject matter any time soon!

Two jetsters who have embarked on a couple of exciting projects are Mark Frankel (of Lear 24, Gloster Javelin and N.A. Vigilante fame) and Tim Farrell. Mark decided to take a brief respite from his twin-engine projects to develop something slightly less complicated—a Douglas F4D Skyray. He'll be using a Hurricane fan driven by a Rossi .90, and he expects the first flight to take place right after you read this.

Tim Farrell can always be counted on to come up with something different. Some past projects include a modified Parkinson Blue Hornet with additional scale detailing, a Dynamax-powered MiG-21 Fishbed and a twin MiG-29. His latest?—this Soviet Backfire bomber with twin Dynamaxes and O.S. 77s. Tim did simplify things by forsaking the swing-wing of the real airplane and using fixed geometry on the model. He has promised a flight report.

The F/A-18 Hornet in prototype markings isn't from the Fiorenze Fan Factory; it's Global Hobbies' new release in its "EZ" line from



Top: New F/A-18 Hornet pusher for .45 engines from Sports Aviation.

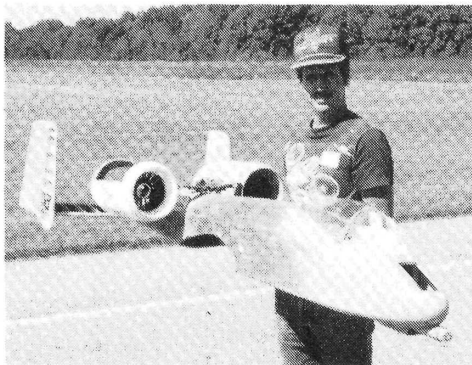
Middle: Mark Frankel's Douglas F4D Skyray just about ready for paint. Now finished in Day-Glo Orange and white experimental scheme.

Bottom: The Tupolev Backfire bomber, scratch-built by Tim Farrell from his own plans. Two Dynamaxes and very long tailpipes.

Sports Aviation. This is good news and bad news: the good news is that it's an ARF; the bad news is that it's not fan-driven! Similar to Sports Aviation's F-16, it's pusher-propped, but larger and designed for .45 power. As I said when the little ARF F-16 was released, we're getting closer to an out-of-the-box ducted-fan R/C model. Who'll be the first to deliver?

flew his F-86 demo model. Dave Ribbe and Jerry Ritch tripped the radar clocks at over 200mph—yes, 200 mph! Dave achieved the top speed of the weekend: 199 mph average. There were many scratch-built jets. Lynn Elster brought his mocked-up A-10 Warthog. Two Dynamaxes will power

(Continued on page 104)



Fairchild Republic A-10A under construction by Lynn Elston of Marion, IL. All-wood construction, built-up and sheeted tail group to keep weight down aft of CG. GAU-8A 30mm cannon in nose looks formidable!

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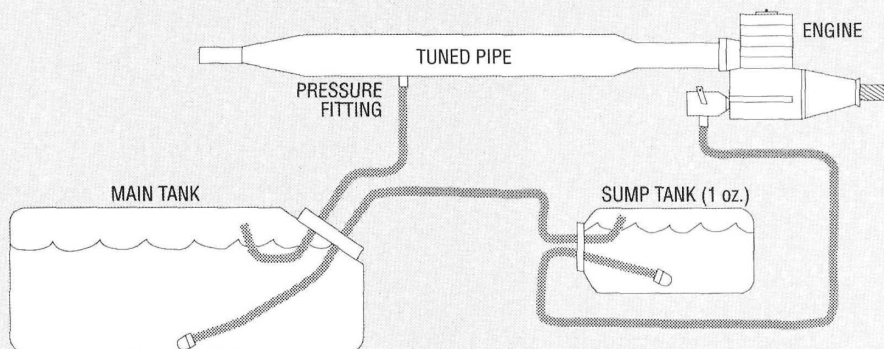
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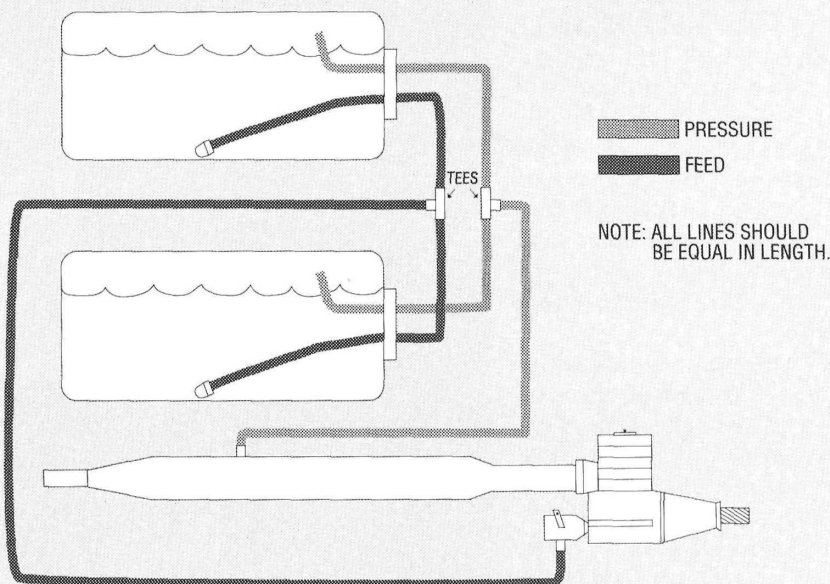
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this rascal—keep us posted, Lynn.

I commend Jerry Caudle on a superb job at organizing his first fan fly. I can only guess what he'll do for next year. Good job, Jerry!!

Start building that killer for next year. Next time, I'll discuss control hook-ups, radio installation and noise abatement. Till then . . .

*Here are the addresses of the companies mentioned in this article:

Byron Originals, P.O. Box 279, Ida Grove, IA 51445.

Bob Violett Models, 1373 Citrus Rd., Winter Spring, FL 32708.

Prather Products, 1660 Ravenna Ave., Wilmington, CA 90744.

Aerotrend, 31 Nichols St., Ansonia, CT 06401.

Yellow Aircraft, 11919 Canyon Rd., Puyallup, WA 98373. ■

EP CHALLENGER

(Continued from page 85)

to spiral it down twice to keep it in sight. With less than a 2-foot span, it becomes small rather quickly.

I now had the attention of the rest of the guys, and can you imagine, they all wanted to try it. I mean, hairy-chested fliers of pattern airplanes, giant-scalers and helicopters wanted to try my little, all-foam, electron-driven, 2-channel cutie. Imagine! Subsequent flights (by others) indicate that about 3 1/2 minutes is what you can expect in motor run time and that if you push the nose over to gain speed and feed in the up, you'll get a loop that the manufacturer strongly advises against. I agree, but we tried it anyway and figured that every beginner (that's who this airplane is designed for) will (intentionally or not) do a loop. It's a milestone in every R/Cer's career and one that most fliers try even before they can land. The Challenger handled it fine, but I don't recommend repeated "abuses" of this type, because the wing simply isn't designed for it. Wait until you're ready for the next airplane.

CHALLENGER CHALLENGED

We flew the airplane another four times that day and, by the last flight, the wind had picked up. This presented the little Challenger with its biggest challenge of the day. With its prop turning furiously, it was released from a hand-launch, which had the appearance of an elevator. All the speed was vertical, zero ground speed.

Playing the rudder to keep the nose into the wind, it climbed and climbed. A turn to either side produced a rocket-like track downwind, and the next turn put it back into the wind, but behind us. The wind relaxed just enough to allow it to make some headway to a point where it was just overhead as the motor wound down. Keeping the heading, it descended just as it had climbed—vertically, and it landed rather unceremoniously on its flexed gear within 10 feet of the launch point!

I've had a lot of fun with this little airplane, and I always take it to the field so that others can fly it. It's surprisingly durable and delivers a good performance. Outside of the landing gear, the Challenger's only weakness is that it looks more toy-like than it really is. It's far more capable than its appearance seems to indicate.

*Here are the addresses of the companies mentioned in this article:

United Model Distributors, 301 Holbrook Dr., Wheeling, IL 60090.

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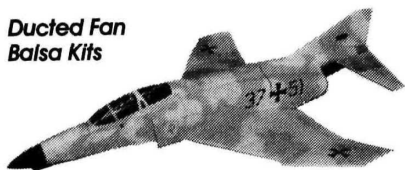


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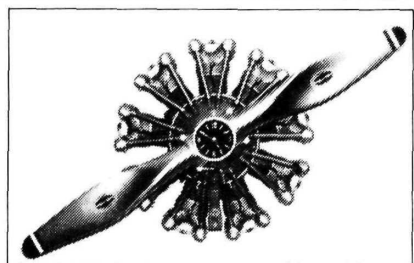
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HELI MAINTENANCE

(Continued from page 93)

movement. If there's a problem, take apart the gyro case and check that the springs are in their proper position, that the weighted wheels spin freely and that the electronic pickup is clean. A *small* drop of lightweight oil on the bearings may be helpful.

Engine and Muffler—Remove the carburetor and glow plug. Disassemble the carburetor as much as possible and check for foreign matter, e.g., dried fuel or oil. If the engine has a caked-on, black oil residue, it can be restored with a commercially available metal cleaner.

I'm sure you can come up with more things to suit your particular helicopter, but this should start you on the right track. The check may seem time-consuming, but it shouldn't take more than an hour.

PUSHRODS AND LINKAGES

Ball links, clevises and pushrods are often overlooked during an inspection, but they're vital to the proper operation of your helicopter. Those that are protected by the canopy or some other helicopter part may not be a problem, but be careful of those near the engine, head and tail boom. Fuel residue and dirt can cause the ball links to wear, and tip-overs or rough handling may bend a pushrod or partially pop a linkage.

- Disconnect *all* ball links, inspect the balls and links for signs of wear and replace as needed. When the links are re-applied to the balls, they should snap into place and not loosen when tugged on. Miniature Aircraft* makes some of the best ball links on the market; they snap firmly into place, but once on, they rotate smoothly with no slop, even after hundreds of flights.

- Disconnect the ball links/clevises at the servos, and push/pull the control linkages as the servo would if the radio were turned on. All linkages and ball cranks should move smoothly and freely without binding. If something isn't right, now is the time to find the problem and eliminate unnecessary, power-consuming drag/friction.

TAIL-ROTOR GEARBOX

The tail-rotor gearbox contains gears and shafts that rotate at very high speeds. They're enclosed and out of our view during normal operation, so it's a good idea to take apart your gearbox and make sure that all is well before the coming flying season.

- Disassemble the drive and output shafts and inspect their bearings for signs of wear. When the shafts are rolled in the bearings, they should rotate smoothly and freely. Any binding means that the interior balls have gone bad and that the bearing needs to be replaced. Re-pack all the bearings with a high-grade grease.

- Tail-rotor output shafts are fragile and can be bent easily on a dug-in landing, or if you accidentally bang the tail rotor while transporting the helicopter. Roll the shaft on a flat table to make sure it's straight.

- Inspect the gear teeth for wear or chips, and replace, if necessary.

- When reassembling the tail-rotor gearbox, pack it full of high-quality grease to protect both the bearings and the gears. I don't think you can have too much grease, but too little will cause tail-rotor gearbox problems in the future—and who needs that?!

My helicopter is ready to fly—is yours?!

*Here are the addresses of the companies mentioned in this article:

High Point Products, 3013 Mary Kay La., Glenview, IL 60025.

Du-Bro Products, Inc., 480 Bonner Rd., Wauconda, IL 60084.

Miniature Aircraft USA, 2324 N Orange Blossom Trail, Orlando, FL 32804. ■

HELI CHALLENGE

(Continued from page 96)

TAIL-ROTOR PITCH

The tail rotor spins at the same time as the rotor head and creates lift of its own, and this is used to counter the torque produced by the engine. Without the tail rotor, the helicopter would pirouette wildly in circles at its yaw axis, as if it were suspended from the main shaft, in the opposite direction of the main rotor rotation.

The pitch of the tail-rotor blades lets you point the helicopter in any direction along this axis. (The yaw axis is best described as an imaginary vertical line down the main rotor shaft through the helicopter.) The tail-rotor pitch is usually connected by a pushrod that runs all the way from the servo back to a pitch-control lever.

To check the proper direction of movement and action of the tail-rotor pitch, proper tail-rotor rotation must first be confirmed. Turn the main rotor head in the direction of normal operation (lead the forward, or leading, edge of a main rotor blade around in circles), and watch the direction of rotation of the tail-rotor blades; they should rotate as the leading edge moves forward.

Move the left stick from left to right and watch the tail-rotor blades. With the blades straight up and down, look down the end of one blade as if you're looking at a cross section of the airfoil. If you envision the leading edge of the blade pulling (or pushing) the tail boom, you can tell which change in pitch will cause the helicopter to rotate in which direction.

The correct tail-rotor pitch control works like this: as you move the left stick on the transmitter to the left, the leading edge of the tail-rotor blade should be pointed in a direction that would cause the tail boom to move to the right (when viewed from the rear). This action will cause the nose of the helicopter to move to the left. In other words, moving the tail-rotor stick on the transmitter to the left causes the nose of the helicopter to move to the left. This is called "flying the nose," and while the method remains controversial, it's still the most popular method of heli flight orientation.

That covers the basics of the typical R/C helicopter controls. When you're installing the radio system in your new bird, try to visualize the function for each one; this should help to relieve some of the frustrations!

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ditional 52 of you called it a P-61C or E, which was technically accurate since the P-61 provided the starting point, but F-15 was the answer we were looking for.

The two prototypes were completed early in 1945, just at the end of WW II and at the dawning of the jet age. There were 175 ordered, but only 36 were produced, perhaps because the need for photo-reconnaissance missions was diminishing as the war came to an end. The 66-foot-span wing formed the basis for the twin boom/nacelles, and each housed a Pratt and Whitney R-2800 radial engine that generated some 2,100hp. Centered between these two powerhouses was a streamlined, bubble-canopied fuselage that housed the two-man crew and all the required recon gear. The unarmed Reporter had a service ceiling of 41,000 feet, a range of 4,000 miles, and it could cruise at 315mph—all of this from a 15-ton airplane; and you probably thought all F-15s were Eagles!!

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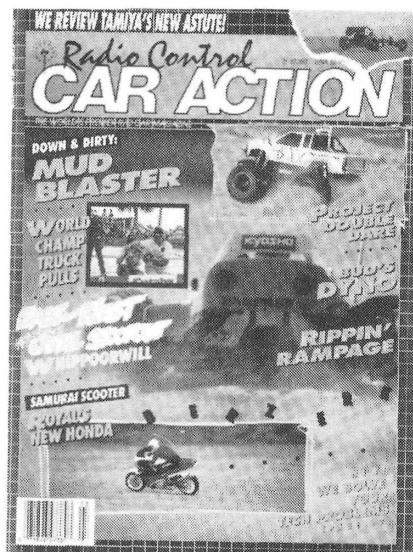
(Continued from page 101)

THE RECEIVER

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Servos—Although Airtronics offers a complete line of servos to fit the needs of almost everyone, I've been using the 94735, which is in the high-performance category. With a coreless high-speed motor, these servos are capable of operating in any helicopter I can think of, and still have plenty of power to spare. Naturally, they're small, light and ball-bearing

(Continued on page 111)

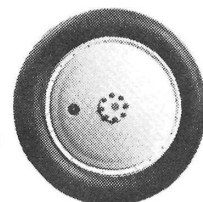


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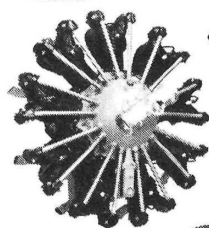
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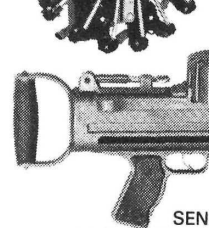
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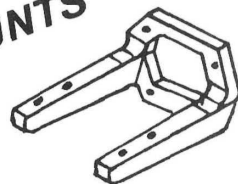


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SPECTRA PCM 7H

(Continued from page 109)

supported for durability and smooth operation. This radio also comes standard with five servos, rather than the four you'll usually find with other radios. Be sure to remember this when you're comparing prices and features.

PERFORMANCE

I wanted to use the radio to see if there were any hidden features or problems that might have escaped my notice, but during more than 100 flights, I haven't had any sort of malfunction; it works perfectly.

My only concern was the closeness of the throttle hold and invert switches; I put a small piece of fuel tubing on the throttle-hold switch to make it easy to find whenever I need it.

The transmitter has a very nice feel, and its plastic back and side panels enable me to grip it tightly in any weather. Lights on top of the signal-strength meter show when the idle-up 1 or 2, or the throttle-hold switches have been activated. (It's especially important to know this when you're starting the engine, as you must ensure that the throttle is in the desired position.)

I highly recommend the Airtronics Spectra PCM 7H radio to experienced fliers who want a radio that's reliable and sophisticated enough for contest flying; it's also good for novices who are looking for a radio that's easy to use and understand and will "grow" with them as they become more proficient fliers.

**Here's the address of the company featured in this article:*

Airtronics Inc., 11 Autry, Irvine, CA 92718. ■

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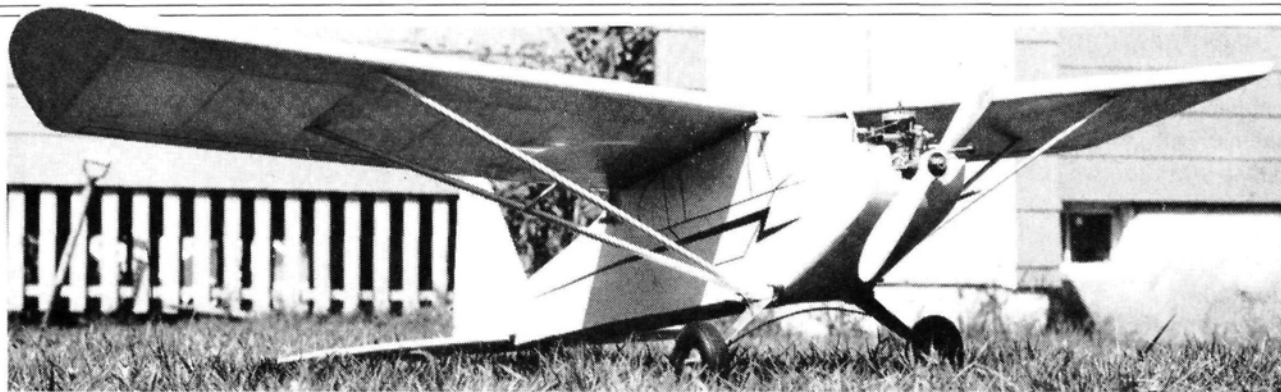
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GOLDEN AGE

OF RADIO CONTROL



Paul Desharnais' LW Super Cub in the '60s; sold in '72, it's still flying! Cub was a companion to the Live Wire Champion.

by HAL deBOLT

Rudder-only competition and champion lineage

ANOTHER MONTH, and again, I have to make choices! Space is limited, and input from readers is so interesting that I find it difficult to allocate my precious few column inches. I'm always ready to hear your preferences, so keep in touch, and help me choose the right topics!



Ed Bull (left) and Terry Davenport with their Live Wires in central New York. Terry's first model, first R/C success and an OTer, too!

RECENTLY RECEIVED

Lou Andrews* writes from Fruitland Park, FL, to say he thinks the Vintage R/C Society (VR/CS) is off to a good start and all OT-ers should be members. He says that, despite problems with his sight, he's determined to complete the R/C project on which he has been working for the past two years, and he'd love to hear from anyone who's interested in his OT designs. You'll find his address at the end of the column; why not drop him a line?

If you're searching for OT plans or kits, you'll be

interested to hear about a catalogue I received recently. It's from Bill LaRue at Hobby Enterprises*, and it reveals a little-known cache of OT plans and his modern kits for some of them. His list is extensive, including OT FF, C/L, R/C and scale. To whet your appetite, how about several Lanzo FFs, a Veco Chief C/L, a Mighty Mambo and a Citeron R/C, or perhaps a Taurus or P-Shooter kit? Bill says this is his way of perpetuating OT R/C, and he'll be happy to send you a catalogue (which is filled with surprises!).

Alfred Lehmberg of Port Hueneme, CA, writes to support Art Schroeder's VR/CS idea of establishing a competition or demonstration exclusively for rudder-only planes—obviously OT-oriented. Rudder-only (RO) produced some pretty fancy flying while it was popular, and as R/C competition developed, it was explored extensively by contest types. Eventually, these fliers accomplished all the basic aerobatics by “spiral

diving” to build up the necessary—excessive!—speed.

Milt Boone and Jack Port carried all this to the ultimate with their Nats wins. Milt's Charger was an outstanding example of RO aerobatic design—not a trainer, for sure! Art Schroeder and Al say that these flying exploits would open some eyes, even today. Al's Leapin' Lena was another notable RO aerobatic design, and he has given the drawings to the VR/CS plan library.

Paul Desharnais of Somersworth, NH, says this column inspires him to fly OT R/C. He had a Live Wire Super Cub in the early '60s, sold it in 1972, and its second owner is still flying it! It isn't surprising that Paul would like another one, is it? The Super Cub wasn't the most popular LW; that honor went to the Champion, which was produced for more than 30 years.

Bet you didn't know that the Champ had a brother patterned after the Piper Su-

PHOTOS BY HAL deBOLT

per Cub. Many Champ enthusiasts built several, but they then thought it would be nice to have its virtues in another airplane. So, using the Piper outlines in place of Aeronca's, the basic Champ was revamped, and even though only its outline had changed, some swore that the Cub was a better performer! What's certain is that the Champ had a companion and modelers had a choice!

How did the Champ enjoy such longevity when the market was glutted with competitors? It was difficult to go wrong with it, and it quickly earned a glowing reputation as a great trainer. Its greatest asset was that it would fly itself—even recover from “panic positions”! It wasn't fast, but it coped well with moderate winds, so it was great for beginners who wanted to learn without an instructor. Soon, accomplished R/Cers recommended it highly.

Edward Bull of William-son, NY, confirms all this. Terry Davenport of Rose, NY, asked Ed how he should begin in R/C, and Ed suggested that he start the same as *he* had some 25 years ago—with a Champ! Terry followed this sound advice; the Champ lived up to its reputation; and we have another new OT R/Cer!

FLYING FIELDS

Ed Bull also reminded me that flying fields have a history, too; he started at the same field in Buffalo as I did, but he moved on during control-line days. As an OTer, where did you start? What happened at that field? Does it still exist?

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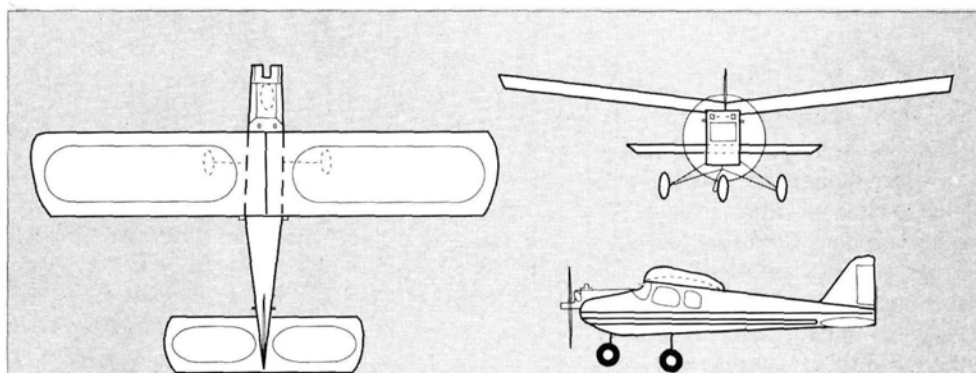
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GOLDEN AGE

my first question was (of course!) "Where can I fly?" From everyone, the answer was the same: Wherle and Young. The convenient 32-acre corner of Wherle Drive and Young Road was on the outskirts of Buffalo, in the shadows of Buffalo's airport, the Cornell Aeronautical Laboratory and the giant Curtiss factory. Even then, how flying started there was a mystery; most simply said, "Models have always flown there!" and Vernon Krehbiel (remember V-K Models?) and others remembered seeing the first gas models there. By the time I arrived, free-flight meant Wherle and Young!

We flew free-flight at



Rudder-only aerobatic flying could be exciting for modern R/Cers. Milt Boone's Nats-winning Charger is a good OT R/C candidate for this.

W&Y from the late '30s to the end of WW II. It was the site of all large FF meets, it was home base for several prominent FFers, and it seemed to have built-in thermal generators so you could always get some good flights.

After the war, the Flying Bisons C/L club was

formed, and members developed flight circles on the corner across from the FF area. With its three maintained grass circles, the club and C/L grew rapidly, and its large C/L meets soon became traditional W&Y attractions. In these circles, many national C/L speed records were set (especially

during the ideal Indian summer engine weather). Three factors benefitted area modelers: W&Y was on bedrock, which wasn't suitable for development; the owner was cooperative; the neighbors were friendly! How could we lose?!

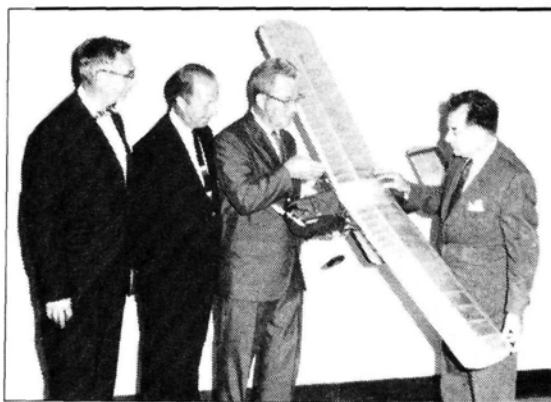
When R/C appeared in the area, Wherle and Young

KEN WILLARD—R/C'S "LINDY"?

THERE WAS A time when *MAN* was filled with reports of daring flights and new records, which became increasingly impressive as both pilots and equipment improved. Now, established records are almost unbelievable and would have been unimaginable in the early days. The first R/C flights seem unbelievable, too, especially when you consider the elementary nature of the available R/C systems and engines.

Even today, one early achievement would raise eyebrows—Ken Willard's daring, 28-mile flight over the ocean from the coast of California to Catalina Island in July '57. Although it lasted only 48 minutes, the flight was over the Pacific, and the route had often frustrated Ken and many others. Just keeping that early radio and engine in good working order for nearly an hour was an accomplishment!

Willard's Big Breathless was hand-launched from a



Ken Willard presents his Big Breathless to the Smithsonian's Paul Garger as Frank Ehling looks on. The presentation commemorates Ken's July '57 record-setting flight.

speed boat in the Long Beach Naval Air Station seaplane harbor, piloted from the boat to Long Point and then to Avalon on Catalina Island. Apparently, all went well until the landing approach in Avalon harbor. Ken misjudged the distance, and a wing tip caught the mast of an anchored yacht, but the water made a relatively soft crash landing and the BB suffered only a dented wing tip.

The BB's R/C system was very basic. Ken was smart enough to use one of the most reliable radios available (if any could have

been called "reliable" at that time!); a heavy, single-channel Babcock BCR-1, which was a superhet band-pass-style tone receiver. Its greatest shortcoming was its weight, but Ken's 6-foot model carried that easily.

Control was by a Bonner compound escapement on rudder, cascaded to a single-action Bonner on the elevator. With a unique linkage to the elevator, when the compound keyed the secondary, Ken had a choice of elevator up- or down-trim. Developed especially for the flight, the Big

was the obvious site, and the first R/C demonstrations were during C/L meets there. The instant popularity of R/C led to the decline of C/L, and the C/L circles were transformed into a runway! So W&Y saw the earliest R/C and the coming of reeds—all phases of modeling.

The friendly neighbors tolerated the wider-ranging R/C flights for a few years, but noise and fears for the safety of their picture windows, eventually led them to protest. After more than 20 years of flying, it was the end of the W&Y era and the start of a major headache for the Flying Bisons. They went from

field to field for many years, but now, 25 years later, they have an admirable facility provided by the county recreation department.

Did this rekindle fond memories of Wherle and Young, or perhaps your area had its own W&Y? How about telling all of us? Remember, this is *your* OT R/C place!

*Here are the addresses that are pertinent to this article:
Lou Andrews, 204A New Castle Dr., C. Burnstead, NH 03225.
Hobby Enterprises, P.O. Box 784, Fruitland Park, FL 32731. ■

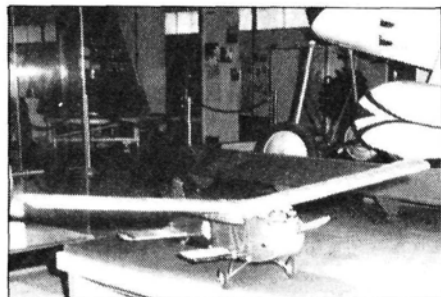
Breathless was set up so that up-trim produced a shallow climb; down-trim was enough for level flight, and nothing beyond directional control was required. Clever!

The engine was the popular K&B Green Head .15, which was fed by a pressurized 20-ounce fuel system (à la Walker). This was obviously much more fuel than was needed for 48 minutes, but who really knew how long the flight would take?

Logical thinking led Ken to set another record. After fine-tuning the Big Breathless on the Catalina flight, it was easy to go for the first R/C endurance record. The only variations were that this record flight took more fuel, and takeoff was required. A later rule change that eliminated the take-

off requirement left the record with Ken for eternity! Unfortunately, Ken didn't tell me how long his flight was, but I do know that he donated the Big Breathless to the Smithsonian and that it's now on loan to our AMA Museum.

Today, we know pioneer Ken Willard as "Mr. Sunday Flier" and we also know that flights over water are still his favorite challenge—just look at his many fine—some legendary—seaplane designs!



The Big Breathless in the shadow of Winnie Mae at the Smithsonian. Note the rubber-bladder-style, pressurized, auxiliary fuel tanks under the wing. For the endurance flight, a small second wing was added to meet FAI rules.

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Send ad and payment to *Model Airplane News*, 251 Danbury Rd., Wilton, CT 06897. **Non-Commercial classified ads** (commercial ads of any kind not accepted at this special rate). Rate: 15 words or less, \$4.50 payable in advance. No charge for name and address. Additional words, 25¢ each. **Commercial classified ads** (rate applies to anyone selling on a commercial basis—retailers, manufacturers, etc.) Rate: 50¢ per word, payable in advance. Count all initials, numbers, name, address, city and state, zip and phone number. **Closing Date** for either type of ad is the 20th of the third preceding month (for example, January 20th for the April issue.) We do not furnish box numbers. If you would like your ad run in more than one issue, multiply amount of payment by number of months that ad is to run. It is not our policy to send sample copies of tear sheets.

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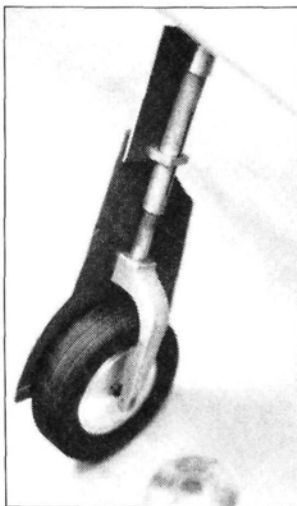
TECHNIQUES

by FRANK TIANO

Judgment day: landing-gear solutions and scale in the great white north

WOW, what a month! Thanks to you readers, there's much to talk about. First, though, let me say that I was *not* responsible for the error in my Masters article, where it said that Bob Fiorenze won in one sentence, and, later, that Bob Violet had done the same thing! No siree, B.V. won the thing, and the mistake was simply a test for you sharp-eyed readers!

Speaking of sharp eyes (?), I recently attended a

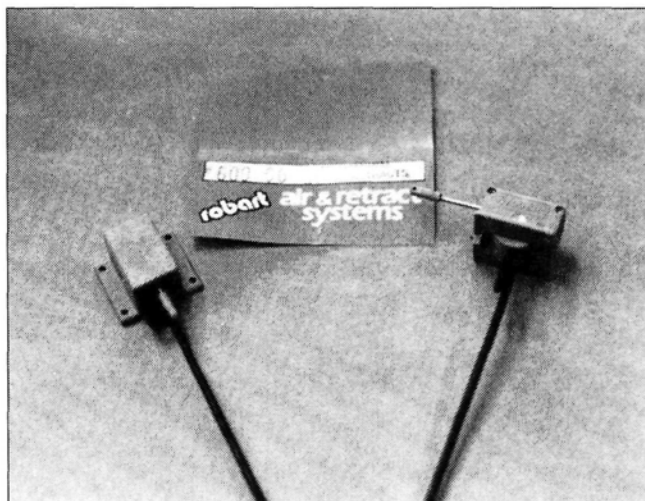


The combination of Glenmis wheels, tires and hubs, plus Platt forks, adds up to some very accurate landing-gear struts.

scale contest that featured the worst static judging I've ever witnessed. No sour grapes—honest! At the well-known Tangerine contest in Orlando last December, I was confronted with a static judge whose total lack of knowledge of the AMA rule book was nothing less than astounding! After a very brief conversation with this man, I can fully understand why some modelers who try scale contests for the first time never come back! Without going into great detail, let me give you an example of the first few minutes of my conversation with this yo-yo. After I'd placed my documentation for the Tony on his table, I went to the judging table so that I could position the model as he wanted it.

"Say, where's your bottom view, in color?" he asked. "And *what* do you expect me to do with these here color chips? And you're missing the front view in color, too!" I looked around for some support from other contestants who were nearby, but all I got were some groans, moans and upward-rolling eyes.

I went back to this nitwit's table and explained that there simply weren't any color photos or views of this 1944 aircraft, and even if there *were*, the rules don't come close to asking for one, as far as the color and markings portion of the documentation was concerned. I showed him the



New additions to Robert's retract line enable you to tuck away the legs on everything from 1/2A to giant-scalers.

section in the rule book about the contestant providing a color *description* of the aircraft and either an *artist's rendition*, *color photo* or *color chips* to au-



To provide a more scale-like retraction/extension cycle, Air/Hydraulic Interfaces from Robinaire replace the in-line restrictors on air-operated retract units.

thenticate the color scheme used.

He looked at me and asked, "Just who do you think you're dealing with?" I humbly asked him if this was his first contest—you know, being a judge. "Heck no! I've judged the Nats and some FIA stuff. In

fact, there's my Byron Hellcat right over there!" I told him that "FIA" was really FAI, and that although the Byro job was nice, I didn't remember ever seeing a baby-blue, blistered finish quite like *that* before. "Well, that's because the brand of house paint I chose wasn't quite compatible with the resin underneath!"

I dropped the subject, told him it was really quite a remarkable effort and hoped for the best. My score was the lowest I've ever received, but so were the scores of many other pre-1950 airplanes. Bill McCallie's score on his P-40 was so low that, with a little egg-ing-on, he might have done a root-canal on this dude right there at the field...*au naturel*, if you get my drift! Anyway, anyone with color photos did OK, and we had a good time in spite of this guy's scoring technique. Many of the contestants,



TOP GUN TWIN TEAM

HERE'S a twin-engine subject that I've mentioned before: the beautiful B-25 Mitchell, built by Bill Steffes of upper New York State from a set of Nick Zirola* plans. Now you, too, can own a set of these plans, as well as the hard-to-make parts that go with a project of this magnitude.

Nick's rendition has a 101-inch wingspan. It's built to 1/8 scale and should weigh 30 to 34 pounds. To power his prototype, Billy used two Zenoh G-23 engines turning 15x10 props. The plans consist of four detailed sheets, and all the parts are balsa or plywood. The plans cost \$38, and they're well worth it! For more information and a new Zirola catalog, send Nick \$2.

however, stated that this may very well be their last Tangerine, and unless something improves drastically, I can't say that I blame them!

GROOVY GEAR GADGETS

Here's a worthwhile doo-dad for your consideration: Robinaire's* new Air/Hydraulic Interface. Simply put, these cylinders are filled with brake fluid, transmission fluid, or 3-in-1 oil, and they're installed in air-operated retracting-gear systems. As alternatives to in-line air restrictors, their primary function is to reduce the retraction or extension time for a more scale-like appearance. Once installed, they never need adjusting. They cost \$30 a pair,

and they're available directly from Robinaire.

A solution to the problem of finding scale landing-gear parts comes in the form of "fork" blanks for \$25 a pair from Dave Platt*. These forks have pre-drilled holes for both the axle and the strut, and they can be cut on an ordinary band saw. In all cases, each aluminum blank is sufficient for one fork, and you can make a single-sided fork or a U-shaped one. Dave is also making a limited run of his 110-degree retract units, and they'll be sold on a first-come/first-served basis. These all-metal retracts are very similar to his competition gears, except that they're slightly longer to accom-

(Continued on page 122)

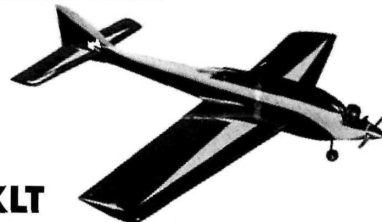
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Wing Span	62½ inches
Wing Area	770 square inches
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Wing Span	65 inches
Length	65 inches
Wing Area	845 square inches
Recommended Engine Size	10 cc
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The XLT is designed for tuned pipe and retract landing gears. Capable of the A.M.A. or Turn-around pattern. Rear or side exhaust.



UTTER CHAOS

SPECIFICATIONS:

Wing Span	63¼ inches
Wing Area	700 square inches
Engine Size	.50-.60 (Glow)
	.90 four stroke

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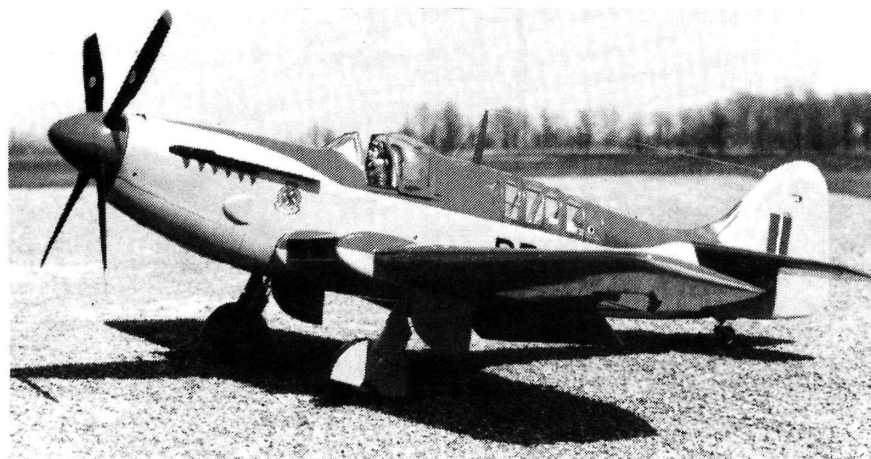
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SPORTY SCALE



The Fairey Firefly's proportions and moments are nearly perfect; unfortunately, it isn't often modeled. This one was built by Canadian Carl Small.

moderate the longer stroke required to provide the extra 20 degrees of retraction.

Hats off to Bob and Tommy Walker at Robart Mfg.*; they've just released their very light, but oh-so-strong, 600-Series retracts for .15- to .40-size model aircraft. The set I received will go into Dr. Farrell's new .25-size mini Hurricane, and I'm really looking forward to

seeing the little model with the gear all properly tucked away. These gear are mechanically operated and are available with 85- or 90-degree swings. Robart's new .40- to .60-size gear are also available with 85- or 90-degree swings, but they're air-operated, and, yes, Robart certainly does offer a nose gear for both sets.

Last, but *definitely* not least in the landing-gear department, we have a brand-new company that actually produces aluminum wheels and hard rubber tires in *any size you want!* That's right, kids—Glenn Aircraft* will make wheels according to your drawings and put an "impossible-to-deflate" tire on said wheel. They'll even cut your scale grooves for you! No, they can't do diamond treads—but that's about all they can't do! The wheels cost between \$80 and \$110 a pair, and that covers just about anything from 4 to 6 inches in diameter. I just put a pair on the Tony, and it sure is grand not to have the tires rolling over at their edges!

CANADIAN CONTRIBUTIONS

Now on to some good stuff! Once again, I'm unable to print photos of some really great airplanes because of the picture quality, but there were plenty left over to make some interesting viewing. First, from Canadian Carl Small, we have a magnificent Fairey Firefly built from a set of Bob Holman* plans. This 62-inch version has been in Carl's workshop since 1983. Carl says it flies so well that he's considering blowing the plans up to a more modern 85 inches or so and using a Tigre 2500 for power. Well, Carl, I have some great news for you. About six years ago, Bob Holman enlarged a set of Firefly plans for me, and they're just right for today's 80-inch trend. I'm sure they'll produce a smashing-looking model.

Last year, another Canadian, Gerry Fingler, told everyone at Top Gun how much he'd like to build a Bronco but just didn't have the time. Some time thereafter, my friend Billy Johnson came to me with a trashed slug of an airplane that he'd bought at some

(Continued on page 123)

WILL THE REAL NASA PLEASE...?



HERE'S the new *Scale Data Source List*, provided by the National Association of Scale Modelers. This publication should be in every modeler's inventory of publications: it tells you exactly where to find certain data on almost every type of aircraft. It lists book wholesalers, titles of hard-to-find books on specific subjects, a comprehensive scale plan list (by subject) and other information needed to research a competitive scale model properly.

NASA publishes this book and a very informative newsletter, and both cost only \$8—and that includes a one-year membership to NASA! So, if you'd like to belong to a *real* scale group, I suggest you forward your 8 bucks to Treasurer Bert Dugan*. I'm confident that you'll be more than pleased with both the *Scale Data Source List* and the membership to NASA!



Canadian scale ace Gerry Fingler prepares his OV-10 Bronco for another sortie. It should be called "Phoenix"—it was resurrected and recycled from the Tiano graveyard (which is never lacking for occupants!).

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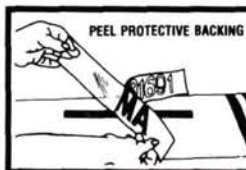
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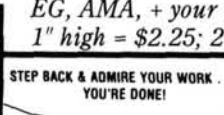
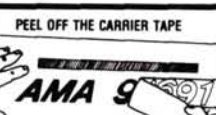
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club's swap shop, and he asked if I knew anyone who could use it. It was a North American Bronco, built from lots of plywood and a little balsa. The original builder had thoughtfully increased its wingspan by 16 inches to increase stability and to lessen the awesome 75-ounce-per-square-inch wing loading! Anyway, Denny DeWeese said, "Hey, why don't we buy the thing and send it to Fingler for Christmas?" Well, to make a long story short, we paid White Shoes \$10 for the slug, Denny cut the wing in half so it would fit in an old Violet F-86 box and we just threw all the parts and the booms

into the box. We shipped it via UPS to Canada where, after considerable delay and many phone calls, Customs finally released the Bronco to Mr. Fingler.

Four weeks ago, I received a letter and a few pictures of none other than Gerry Fingler with *our* Bronco, all fixed up and painted in really cute colors—the whole thing! The note simply said, "You were kind enough to forward pieces of an OV-10 to me! Well, you gave me a challenge; the enclosed photos are the result. Have a good day, Ace!"

From last issue: for those of you who are trying to reach Gene Barton, his num-

ber is (714) 539-9142. My phone's been ringing off the hook!

So that's it for this month. Before closing, I'd like to pass on a few words of caution to newcomers to this wonderful world of miniature aircraft:

- No matter what the know-it-all at the field says, do *not* attempt to fly a flap- and retract-equipped model with a 3-channel, pistol-grip radio.
- A new D&B F-86, equipped with a Scozzi fan and a Profi .46, is *not* the new state-of-the-art ducted fan!
- Reversing the gull portion of the wing

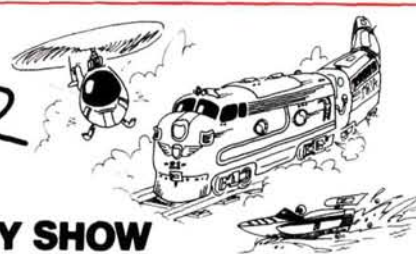
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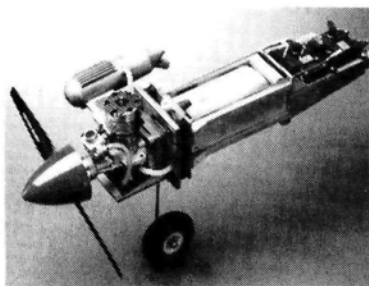


COVERITE Vintage Cartoon Artwork

Coverite brings back the cartoon artwork that decorated the noses of American bombers during WW II. The company has developed 15 miniature weatherproof and fuelproof decals, each approximately 4 inches in diameter. They're pressure-sensitive and will stick to wood, plastic, fabric, metal and glass. Some are made of a special vinyl that's extremely flexible and can be wrapped around compound curves. They also look great on the wing or tail feathers of a typical .40-size trainer.

Price: \$2.50

For more information, contact Coverite, 420 Babylon Rd., Horsham, PA 19044.

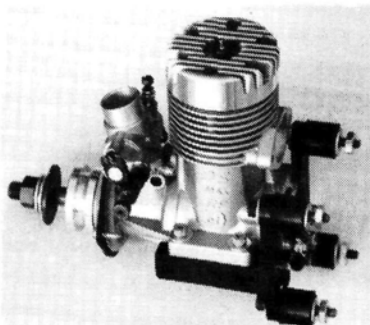


MODULAR MODELS Power Module Squadron

Modular Models' Power Module Squadron is a group of six R/C model aircraft that share a removable Power Module containing: 40- to .65-size engine and muffler; two stages of noise and vibration suppressors; fuel tank, fuel lines and optional filler valve; bat-

tery, charging jack and switch; receiver and three servos; nose wheel; throttle and nose-wheel control linkages. The features of this concept are: low cost (one Power Module shared by two or more planes); flying flexibility (Power Module can be removed and inserted in less than 5 minutes); reduced building time; simplified adjustments, maintenance and replacements; unsurpassed suppression of noise and vibration; better weight distribution for improved flight characteristics; greater crash resistance; adjustable thrust line; engine flexibility (one or more model can share multiple Power Modules).

For more information, contact Modular Models, 80 West 78th St., Suite 260, Chanhassen, MN 55317.



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Here's a universal vibration-isolation engine mount that has all the excellent noise- and vibration-reducing characteristics of the original Vibra-Damp, as well as beams that can be installed easily. By using the engine's mounting lugs, it's easy to remove and install the engine in the airplane. This mounting system will reduce vibration more than any other mount, and it will fit most engines up to a .60-cubic-inch 2-stroker. Company tests show that a solid engine mount transfers all 95 Gs that the engine produces to the airframe, whereas Vibra-Damp Beams reduce the transmitted vibrational G-force to 11 Gs! The

system includes all the hardware you need to mount the engine to the fire wall (including a front limiter ring recommended for .60-size engines). Backplate-to-beam-style retrofit kits are available and require no modifications to the airplane.

Price: \$21.50 (plus \$1.75 shipping & handling)

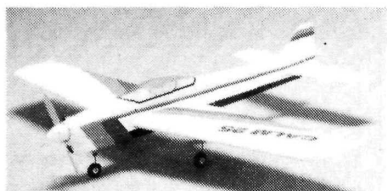
For more information, contact Performance Products Unlimited, 7093 E. Dodge Rd., Mt. Morris, MI 48458.



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For more information, contact Top Flite Models, Inc., 2635 S. Wabash Ave., Chicago, IL 60616.

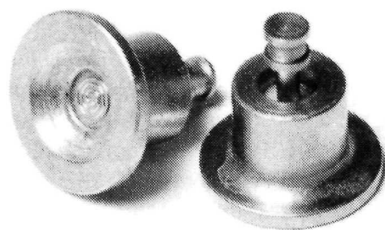


GLOBAL HOBBY DISTRIBUTORS EZ Calm 25

Designed by Japanese National Aerobatic Champion Yoshioka, the Calm 25 is the ideal ARF sport-size pattern flier. Its broad, flat fuselage sides allow great knife-edge maneuvers. Thick, symmetrical wings give excellent handling. Loops, spins, hammerhead stalls, Lomcevak, rolling circles—the EZ Calm 25 can do them all. With this ARF pattern ship, all the major components are built and covered. For even cleaner flying performance, tricycle retracts are available as an option. Specifications: 41.2-inch length; 49.6-inch span; 462-square-inch area; 70- to 74-ounce weight; .25 to .32 2-stroke/.25 to .45 4-stroke engine; 4-to 5-channel R/C required.

Price: \$240 (no. 100824)

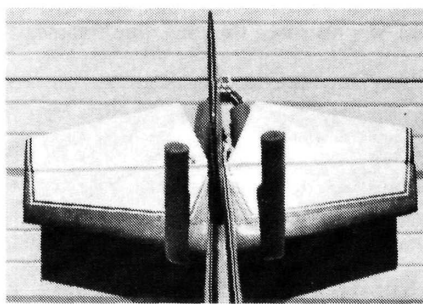
For more information, contact Global Hobby Distributors, 18480 Bandilier Circle, Fountain Valley, CA 92728.



TWINN-K GloBee GB-5R Glow Plug

The GloBee GB-5R Racing GloButton, with its unique, flat-wound, spiral-coil element and exclusive, glass-to-metal, high-temperature seal, is now available. GB-5R is a 1/2A glow plug with a hemispherical combustion chamber that uniformly burns fuel in the 50- to 80-percent-nitro range. Its bottom flange thickness is .050 inch. The GB-5R is for high-performance, heavy-duty applications in .049 to .051 engines, and state-of-the-art process control makes it very reliable.

For more information, contact Twinn-K, P.O. Box 31228, Indianapolis, IN 46231.



BIG SKY R/C Wall Hanger

Big Sky R/C's latest release is the Wall Hanger, which was designed for airplane owners who like to store and/or display their prize possessions on their walls. Attach the hanger to the wall at the desired height, and put the tail of your favorite machine into it. The plane is protected by heavy tubular foam, and one size fits all.

Price \$9.95 (includes shipping & handling)

For more information, contact Big Sky R/C, Lander Indust., 1005 19th St. Ct., Havre, MT 59501.

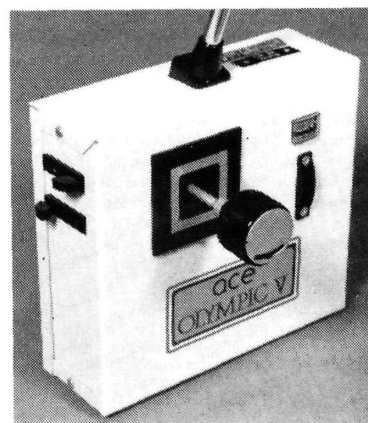


DC AVIATION Scale Aircraft Calendars

DC Aviation announces its new, 1990 R/C Scale Aircraft Calendars. Each contains 12 full-color photos of R/C scale aircraft, all accompanied by information describing the model and its builder. Printed on high-gloss card stock to ensure durability, the pictures are worth keeping year after year.

Price: \$6 (plus \$1 shipping and handling)

For more information, contact DC Aviation, P.O. Box 98, Big Rock, IL 60511.



ACE R/C Olympic V System

If you're left-handed and fly single-stick, you've probably been wishing for a system with reversed controls, and the Left-Handed Single-Stick Olympic V System is just that. Each control mirrors what's on the standard system, and it has the same great features as the standard Oly. For the heart of this system, Ace uses the basic Silver Seven transmitter and receiver electronics, with capabilities of up to five channels (four channels, standard; fifth is optional), and there's an optional Model 91 receiver. Available assembled only, the Olympic V is complete with Ni-Cds throughout, but it comes without servos (so you may choose the size, type and price range). Any positive-pulse servo will work—import or domestic; Deans connectors are included. Available as options: dual rates on up to three channels, and a fifth channel (retracts). You can install these options yourself, or you may have them installed by the manufacturer (\$7 for each option). System includes: transmitter with Ni-Cds, receiver, receiver Ni-Cd pack with switch harness, system charger, Deans servo connectors and frequency flag.

Price: \$159.95 (20G500SL) Left-Hand SS Oly V w/Std Rx

\$184.95 (20G500SL91) Left-Hand SS Oly V w/M91 Rx

\$109.95 (11G40SL) Left-Hand SS Oly V Tx only

For more information, contact Ace R/C Inc., 116 W. 19th St., P.O. Box 511, Higginsville, MO 64037.

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Retailers: Make your business grow with new traffic! Now you can advertise your hobby shop in the **Model Airplane News Hobby Shop Directory**. The listing will be published monthly and will be listed according to city and state. You will have 3 to 4 lines, approximately 20 words, in which to deliver your sales message, plus space for your store's name, address, and telephone number.

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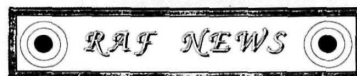
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For further details or information on our special introductory offer, call toll-free 1-800-243-6685 and ask for Katherine Tolliver.

CLUB OF THE MONTH



ROCKINGHAM AREA FLYERS CLUB

1348 Cumberland Dr.
Harrisonburg, VA 22801

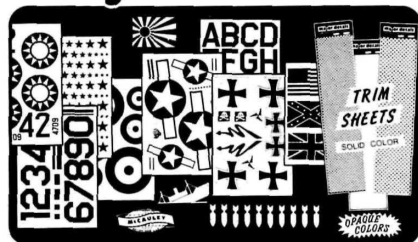
It sounds as if the Rockingham Area Flyers (RAF) Club of Harrisonburg, VA, has a great flying field. The runway measures 550 feet by 80 feet, and that doesn't include the pit area! The parking is convenient, members can fly anytime during the day and, thanks to the efforts of Randy Ryman and Garland Estep, they have a new club field roller that's 7 feet long and weighs 2,000 pounds!

A few "fanatics" can always spice things up, and the RAF Club seems to have some of those, too. Two of its members have qualified for the AMA All Seasons Flyers Patch by flying at least once every month in 1989. When asked why he flew in 10-degree weather with a foot of snow on the ground, Club President Don Mussleman replied, "I was just doing my job." The other intrepid flier, Rick Christoph (editor of the Club's newsletter) writes, "this is certainly a strange sport." Strange?—perhaps, but it seems as though "these two fine fliers" are having a great time.

The RAF Club is only one year old, but members have made a lot of progress, and they certainly have the right attitude. Safety is a concern (a more restricted area is needed for spectators), and member participation is stressed (the weekly mowing of the field and pit area is a high priority). So, dust off those lawnmowers, RAF members—sounds as if you're going to have a great season!

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SPORTY SCALE

(Continued from page 123)

on a Corsair will *not* reduce its tendency to snap-roll; installing Rutan canards is the *only* remedy.

• It takes 9,736 glow plugs to get enough platinum to make your girlfriend even the tiniest of rings—so just forget it!

• Placing your new structure between the backs of two chairs and piling bricks on it until the structure breaks is *not* the way to measure wing loading! And if you're talking to somebody who thinks it is, there's certainly no better time to *check that six!*

*Here are the addresses of the companies mentioned in this article:

Robinaire, P.O. Box 6766, Lake Worth, FL 33466 (407) 439-6965.

Dave Platt Models, 1306 Havre NW, Palm Bay, FL 32907 (407) 724-2144.

Robart Mfg., P.O. Box 1247, St. Charles, IL 60174 (708) 584-7616.

Glenn Aircraft, 5528 Arboga Rd., Marysville, CA 95901 (916) 742-3957.

Bob Holman Plans, P.O. Box 741, San Bernadino, CA 92402.

Nick Zioli Models, 29 Edgar Dr., Smithtown, NY 11787.

Bert Dugan, NASA Treasurer, 11090 Phyllis Dr., Clio, MI 48420. ■

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treated to 58 degree of hardness. Clear cover is a safety lock and a magnifying glass.

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